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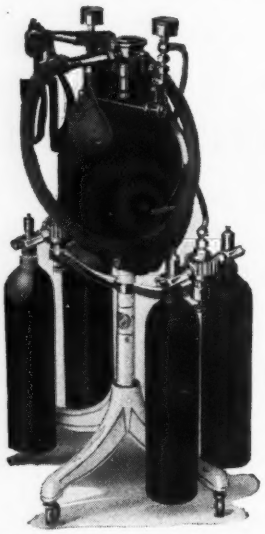

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ORIGINAL ARTICLES

ORTHODONTIA AND ITS DEVELOPMENT*

BY DR. WALTER COOLIDGE CHAPIN, NEW YORK CITY

ORTHODONTIA has not suddenly become a science and a profession. Contrary to some opinions, many, many years have contributed to its development. In the modern way, then, let us take an "airplane view" of orthodontia; a view in which one may see into distances, where the monuments of progress stand out in bold relief, endeavoring as we go to analyze the evolution and progress of orthodontia and to interpret the foundation principles as they have evolved during the periods of orthodontic history. Upon an intimate knowledge of what has been tried in times past, both the successes and the failures, can we build into the future. "Things not constantly brought before the mind are apt to fall off the hooks of memory."

History proves that progress moves slowly and in cycles, and that, due to the lack of knowledge of what has been already accomplished, each generation treads in part over the same ground, spending much energy upon solving the same problems, instead of progressing steadily forward. The ability of man to build upon the acquired knowledge of his predecessors is a great characteristic which differentiates him from animals. In animal life, each generation begins at the same place and has to learn the same habits which contribute to its preservation. Man, in contrast, records the lessons of experience for the benefit of his future generations. Since we, as human beings, are possessed of this great power of communication, let us not fail to use it to the utmost. It is not necessary to be a student of history to bear witness to the fact that certain men of today are uselessly spending their time and energy on problems already solved, but they are not the men contributing to progress and to science. Therefore, let us peer into the past, that we may know the minds and the works of men who have brought orthodontia up to its present development.

*Read before the Alumni Society of the Dewey School of Orthodontia, Monday, August 6, 1928, Hotel Vanderbilt, New York City.

Irregularities existed and were noted by early man and therefore are not altogether the recent product of civilization. Whether orthodontic operations were performed in these most ancient times, we probably will never know, because the evidence is perishable. Indeed, even in our own age, as you know, it is hard sometimes to detect just a few months after treatment any evidence of the efforts of the orthodontist. The original endeavor of man to control the position of his teeth takes us back according to history to 50 A.D. when the principle of pressure and its influence in moving teeth was first recorded. It is but natural that orthodontia, the same as other sciences, had its humble beginning by primitive man in the form of finger manipulation, rather than by any form of machinery.

The guiding of permanent successor teeth to their positions by finger pressure was the only method practiced up to about 1600. At this time the file was introduced. For two centuries, works were published and showed in detail how crowded conditions of the arches could be relieved by filing the teeth narrower, and how long and jagged teeth could be filed shorter and their corners be rounded off.

It was not until 1700 that some surgeons confined their attention to the teeth only, and, therefore, gave birth to dentistry as a specialty of medicine and surgery. Yet, it is interesting to note that these men emphasized the correction of irregularities of the teeth. They stated their objectives as follows: "First, to open or widen the teeth when they are set close together; second, to cleanse them when they are foul; third, to hinder their rotting; fourth, to stop the holes which grow in them; fifth, to file them when they are too long and jagged; sixth, to pull them out when rotten; and seventh, to substitute artificial ones in the place of the natural."

About fifty years later treatment consisted of filing teeth, immediate surgical correction, the extraction of crowded teeth, and the use of appliances. History cannot tell us who invented the first appliance, but it is worthy of note that in 1746 Fauchard used an appliance which he called a "band," made of a strip of gold in the form of a horseshoe or arch to which the teeth were ligated. This marked an important step in orthodontia, for these same mechanical principles are used in regulating appliances today and, indeed, it was from this early appliance that the modern expansion arch evolved.

Chapters already were being written upon the problems of irregularities and case reports made with claims of success, which would excite the envy of many present day orthodontists. About 1750, a case was reported of a patient, twenty-two years of age, having a bad arrangement of the incisors and canines and a deformed countenance. He was treated in four days and the teeth were, as the dentist said, put in "perfect order." In fact, in those days, it was not an uncommon practice to use the "pelican" or forceps for the immediate movement surgically of the teeth into line, after which they were ligated until they "tightened" in their sockets. It is plain that theirs was a plan of treatment for securing quick results.

Irregularities during these early days were attributed to certain influ-

ences of the deciduous teeth and to the fact that, since the permanent teeth were larger than the deciduous teeth, there was not enough room for them in the jaws.

John Hunter, the famous anatomist and dentist, in 1771 illustrated teeth in ideal or normal occlusion and seemed to be the first to mention the dependence of good features upon normal occlusion. These eighteenth century men did not attempt corrective measures from the standpoint of improving the function of mastication. Treatment was confined more or less to royalty, for may it be remembered that court people were ever so fastidious as to their appearance and that it was for esthetic reasons only that corrective treatment was instituted.

As the men after 1800 began to study their problems, they began to realize certain limits of their ability and to recognize the power and influence of mechanical appliances. This is indicated by the era of extraction, followed later by the era of complicated mechanical devices. They began gradually to recognize factors of occlusion. Since intermaxillary force, such as we use today, had not yet been discovered, were they not justified in their extraction of premolars so that in maxillary protrusions the arches could be brought into better harmony? Incline planes and plates were invented for this purpose.

The age of extraction lasted many years until appliances which could produce sufficient tooth movement to alleviate very crowded and extreme conditions were finally invented. In fact, it has been only since 1900 that the leaders of thought have been able to create general sentiment in the profession against the evil practice of extraction.

Orthodontia received its greatest amount of stimulation from the French during the first half of the nineteenth century. It was the Frenchman, Lefoulon, who coined the word Orthodontia and used it for the first time in the title of a paper, but the term did not come into common usage until a great many years later.

Vulcanite, which was used for a great many years as the basis of appliances, was introduced in France and had a profound effect upon orthodontia as well as upon dentistry. The Coffin vulcanite plate (1860), consisting of a "*W*" shaped spring uniting two halves of a plate, was the beginning of the use of spring force and was the foundation of a later, so-called "system" of orthodontia.

It is not definitely known who first produced cement except that it made its appearance in England at about this time. Schange and others used a band for anchorage depending for security upon the tightening of a clamp which later developed into the clamp band. It was not until about 1871 that Magill and Shepard recorded using cement for attaching bands to the teeth.

During the century prior to 1900 the etiology of malocclusion revolved about theories regarding heredity, the most prominent of which was the one about large teeth being inherited from one parent and small jaws from the other. Some men even believed that irregularities were signs of degeneracy. They did not, however, fail to emphasize the harm caused by the premature loss of the deciduous teeth and the evil effects of mouth-breathing and bad habits of childhood.

Perhaps it was the demands of the patients for immediate transformation rather than the dentists' theories that account for the very rapid movement of the teeth and for the short time allotted for treatment. Writings of these early days fail to reveal any recognition that a longer time might have been desirable. There is no doubt that it has taken a considerable time to educate the public not to expect immediate results, and to wait over a period of years for the completion of an orthodontic case. One cannot help but feel that in those days the dentists were a determined lot of men who felt that the degree of success of a case depended greatly upon "how long a time it took." Their problem seemed one to them of how to make an appliance and anchorage strong enough to exert the greatest amount of force. This problem was best solved by the jack-screw principle which soon expressed itself by an era of appliances utilizing screw pressure in many unique and complicated forms. With this came the theory of "Intermittent Force," which dominated the minds of the men during the latter part of the nineteenth century. Together with the screw, the power of the wedge was greatly utilized. Wood, metal and rubber were the basic materials used in making the wedge.

Malocclusions not having yet been satisfactorily classified, each case was considered a particular problem unto itself. As late as the year 1887, in reply to the query, "What kind of a fixture do you use *now* for regulating teeth?" Dr. Norman W. Kingsley said, "I cannot regulate teeth with any one fixture. Some variation of an old appliance must be invented for almost every case. I once started out with the idea, it seems idiotic as I think of it now, that I could publish descriptions of a sufficient number of cases to cover the whole ground of regulating, enabling anyone who came after me to hunt up the particular case that met his need, and find the treatment fully described. But the more I went into it, the more hopeless the task became."

The latter part of the nineteenth century might be called the Mechanical Age of Orthodontia, for men focussed their attention upon appliances and were most happy when they had invented new mechanical features. Appliances soon became classified into fixed and removable, with many advocates of each class. It was a time of "systems" in orthodontia. The men and ideas of this day have since been referred to as of the "Old School."

Let us, however, remind ourselves that they were busy as dentists, able to give only part of their time to the problem of the correction of irregularities, and, considering their many duties and subjects requiring attention, orthodontia received much stimulation and much enthusiastic support at the hands of these energetic men. We owe much to them and too high a tribute cannot be given for their contributions to the development of our science.

During the nineteenth century, orthodontia had been poorly taught in the colleges. It was laid before the student just as it was practiced—without system and without scientific foundation. Knowledge had not yet been classified. Each school under the influence of a different man taught different ideas and different technic. With such a conglomerate smattering it was plain that no student would ever be enabled to make it his profession. The very nature of the work seemed to separate it from the general practice of dentistry.

The departure of the old and the coming of the new century marked a great turning point in the development of orthodontia. In response to the demand for better teaching and more knowledge, the Angle School of Orthodontia was formed (1900) with four students enrolled. This school for many years exerted a vital influence over the thought and practice of orthodontia, and during its time did much to establish orthodontia as a distinct specialty of dentistry. In 1901 the American Society of Orthodontists was organized and held its first meeting in St. Louis. Since its inception, advanced orthodontic thought, both in theory and in practice, has been given to the profession and to the world through the avenues of this society. Fortunately, it was founded upon a broad foundation, having for its purpose the promotion and the dissemination of scientific truths and the ideals of helpful professional conduct among brothers of the same profession.

Perhaps one of the greatest contributions to the successful practice of orthodontia was Angle's Classification of Malocclusion and the deeper appreciation of occlusion and its forces. Its influence cannot be overestimated, for it has had such a direct bearing upon the mode of treatment. Although this classification was accepted from the beginning as a great aid, even then it was found wanting by some men. They recognized that it did not relate the teeth to the cranium.

It cannot, however, be contradicted that Angle's Classification brought standardization to both treatment and appliances. Treatment moved a great step forward with the introduction and use of intermaxillary force or the "Baker Anchorage." This sounded the death knell to the advocates of extraction. Appliances, too, emerged from a state of chaos to a degree of standardization, which limited the necessary designs for treating all cases to only a few. It became the ambition then to so simplify appliances and their parts that all practitioners might procure the parts from a dental manufacturer and by a few simple soldering operations, make the appliance required. The era of the "store appliance" emerged.

Contributing greatly to the advance of appliances and their technic was the adoption by the profession of gold and platinum alloys in the place of German silver and other base metals. Think of the handicap under which the profession worked when they used base metal appliances almost entirely!

With the advent of the so-called "New School," theories of practice were based upon an understanding of normal occlusion, its relationship to harmonious facial lines, and the requirement of the full complement of teeth for best results. Art, the development of the bones of the face, the influence of the surrounding structures, such as the nasopharynx, and comparative anatomy, were subjects engaging the best minds of the day and were signs pointing to the "healthy" development of the science of orthodontia.

As men became much interested in the associated structures, they gave special attention to the nasopharyngeal tract. For a long time, adenoids and tonsils, associated with mouth-breathing, had been considered the cause of many facial and occlusal deformities. The discovery of the beneficial effect of the expansion of the upper arch upon the lateral maxillary bones and the

nasal tract gave new impetus to the cause of orthodontia, or, in other words, a new selling point. That it had a good effect all agreed, but as to how much it really helped patients or how much more nasal space this treatment really provided was a matter of great difference of opinion. Men inserted strong appliances and claimed that the middle suture was separated. This was finally disproved by an experiment upon dogs, and this treatment has since been abandoned.

Allow me to quote an incident related by an orthodontist before the American Society as late as 1912. "I have twice had occasion to use appliances where a jack-screw was placed across the roof of the mouth and used in the good old-fashioned way of twisting up as tight as possible, and in each case there must have been the opening of the suture. There was every outside indication of it, a condition existing where there was separation between the front teeth, a slightly hollow place extending from front to back along the median suture, the soft tissues tightly stretched and slightly painful at this place. In one case in addition to this the two maxillae were so loose they could be moved about. I am sure there must have been a genuine suture opening in that case, extending from the front clear back past the first molars."

A member in the audience replied, "That was no suture opening, Doctor; that was a fracture case and you didn't recognize it." (Laughter.)

First member, "Well, whatever it was I don't know, for I was too scared to make any examination. I had no thought of pursuing any advantage I might have gained, but only to keep from being found out."

It seems most strange that in all the early literature, when teeth were moved rapidly, that the subject of retention was not, of necessity, discussed. The problem must have presented itself, or else they never saw their patients again after the teeth were moved. Retention became a serious concern to the profession after the art of actually moving teeth had become a rather accepted accomplishment. Orthodontists had seized upon ideal type occlusion as their one big ambition and tried to make all individuals and their teeth ideal. They did not at first regard the value of muscle training and the influence of the overlying soft tissues with respect to retention. In addition, their practice of rapidly moving teeth with appliances not in accordance with the laws of physiologic tooth movement and their failure to recognize the limits of the individual normal, made it no wonder that they could not retain teeth in their new positions—positions in which they were arbitrarily placed by the hand of man and machinery according to *his* designated normal or ideal occlusion.

Men became interested in growth processes, especially in bone growth, and delved into this mystery both from a biologic and histologic standpoint. The results of these investigations elevated orthodontia to be considered a problem of biology rather than a problem of mechanics.

Attention was called to the growth and development of deciduous arches and the presence of early deformities. This resulted in advocates of early diagnosis and treatment, and had a definite influence upon the age at which treatment was instituted. It also served to change the ideas regarding the length of treatment. Instead of a case taking a few months, the length of

treatment was now stretched in some cases to a period of years, and justified. It had taken centuries, however, for the time allotted for treatment to evolve from that of a few days' duration up to a period of years.

The prominent rôle of heredity in etiology was lessened in the minds of men by the extension of knowledge. Heredity no longer had to be spelled with a capital "H," nor did it continue to account for otherwise unexplainable phenomena in the realm of deformities. The etiology of malocclusion was enlarged to embrace not only heredity, and the so-called acquired causes, but also to include endocrine and constitutional disturbances, together with diet.

Newer knowledge had a marked effect upon appliances. The theory of "intermittent force" was abandoned, because growth processes do not take place intermittently in the same sense. New appliances were designed for exerting positive pressures and for root movements of the teeth. They were exemplified in the pin-and-tube and the ribbon-arch appliances. The valuable principles of the fixed appliances and of the removable appliances were moulded into more ideal mechanical devices. Men more and more appreciated the stable anchorage of the fixed mechanisms and the constant, gentle stimulation of the spring force of removable appliances.

It is interesting to note that the lingual arch as used today was first used and advocated as a retainer only. It has since come into great popularity because of the addition of finger springs and because it is so admirably adapted to what may be considered up-to-date theories of practice.

For me to attempt to discuss the development of present day orthodontia is to step where only angels dare to tread. Yet, for the completeness of the paper and in order that the evolution of orthodontia may be made more clear to you by contrast, let us consider the present trend of thought and practice.

Present knowledge has caused us to attach greater importance (in many cases) to endocrine and nutritional disturbances and to the part that they play in the etiology of malocclusion. More consideration is given to calcium metabolism and bone growth processes. Today we are greatly concerned in the child's general health and we recognize its bearing upon orthodontic treatment.

Diagnosis and the classification of malocclusion have recently received much attention. Efforts have been made to classify deformities according to the relationship of the teeth to the skull. In the minds of some men these attempts have been far from successful. The value of arch predetermination as an important contribution to diagnosis and treatment has been admitted by many orthodontists. The x-ray contributes a definite service to diagnosis and treatment and is considered an indispensable aid.

Appliances have been simplified in design and their technic considerably standardized so that they may be constructed by the orthodontist. It is no longer the age of the store appliance but an age in which standard types of appliances are adapted to classified conditions. Each case receives individual attention and consideration from the operator. Appliances are designed to give constant and gentle stimulation to the teeth without holding any rigidly. The action of the appliances is generally caused by springs, rubber elastics or ligatures. Direct screw pressures are avoided.

Successful treatment today does not require the rapid movement of teeth. Quite to the contrary this "hurry up" type of treatment is rapidly being abandoned. Better results are being secured through a clearer understanding of etiologic factors and more correct diagnosis. The treatment is being based upon laws of physiology and biology. Early treatment is advocated, but slight deformities are given an opportunity to correct themselves. Consequently, treatment is begun only when necessary. Continuous treatment is not always desirable. Oftentimes it is advisable to carry it on periodically.

Fewer promises are made and greater effort is put forth to secure good results. Adult cases are less frequently undertaken, due to the deeper realization of the limits of man's ability.

Today we recognize the great influences that the muscles and overlying soft tissues exert upon diagnosis, treatment, and prognosis. Proper muscle exercises are considered of great aid to the successful treatment of many cases.

The problems of retention are becoming less of a concern. Soldered retainers have been abandoned and the retainers that are being used are usually of a movable or removable type.

The results that are being obtained by our present methods are uniformly better than those of the past. Results which look artificial, such as the "orthodontic mouth," are not being produced. The teeth and features of the face look more natural, and there is much less injury to the gums and tooth structures.

In regard to the orthodontia of tomorrow—we expect no startling discoveries—yet we predict it will be practiced in a way quite different from that of today.

Treatment will be based upon gentle stimulations applied at periods of accelerated growth, with rest periods in treatment corresponding with those which nature takes, and at all times not interfering with regular functional activity. Every effort will be made to coordinate the periods of artificial stimulation by appliances, with those periods of accelerated growth of the patient, and to coordinate the rest periods in treatment with those which nature takes during the growth of the individual. To do this, closer relationship will have to be established with the pediatrician. A complete health and growth history of each patient will contribute as much to the basis of treatment as models and mouth examinations. Research work, we hope, will make it possible for us to have signs whereby we may cooperate with nature at the proper times and, in this way, treat only when treatment will do some good. Recently, comparative x-ray pictures of the hands have been suggested as being a sign of the condition of growth processes and as a guide to strategic treatment.

Teeth will be moved only at the growth rate normal for the individual, so that the investing tissue cells will not have suffered under treatment. Nor will teeth be moved to positions beyond that which would be normal for the age of the patient.

The future plan of treatment then will practically eliminate the problem of retention and the wearing of retainers.

In the future, better results will be obtained with less effort and with less misapplied effort. I trust that we may do our part in bringing this to pass by the giving of ourselves to the progress of our profession.

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A COMPARISON OF RESORPTION OF THE ROOTS OF DECIDUOUS TEETH WITH THE ABSORPTION OF ROOTS OF THE PERMANENT TEETH OCCURRING AS A RESULT OF INFECTION*‡

By John Albert Marshall, D.D.S., Ph.D.†

ABSORPTION of the roots of the deciduous and of the permanent teeth are processes which may involve either normal anatomy and physiology or morbid anatomy and pathology. In other words, there may be changes in form and structure of a tooth as well as changes in its function. In fact, the term pathologic physiology may well be applied to some of the problems which confront us. But, before the pathology is discussed, it is necessary to consider for a moment the physiologic processes involved in the shedding of the deciduous teeth.

In the first set of teeth, the roots are hardly formed before resorptive processes begin to make themselves manifest. Commencing under normal conditions at the apices of the central incisors, absorption commences about a year after the roots have been completely formed. The preponderance of data indicates that these degenerations commence at about the middle or latter half of the third year. Although the *earlier* changes occur slowly the final absorptive processes are greatly speeded up until the fibrous union is severed, and only epithelial apposition remains. It takes about four years before the deciduous central incisors are lost, and the spaces requisite for the permanent teeth are produced. The lateral incisors are attacked a few months after the centrals; then follow the first deciduous molars, commencing at about six years and being completed at about ten years, the second molars a few months later, and finally the deciduous canines. These latter show evidence of resorption at about the eighth year and are lost normally by the twelfth to thirteenth year.

There are, of course, many deviations from this chronologic table, the causes of which may be summarized under several heads: First, *delayed de-*

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*Read before the meeting of the Pacific Coast Society of Orthodontists, San Francisco, Feb. 20-22, 1928.

†From the Laboratories of the George William Hooper Foundation for Medical Research, and the College of Dentistry, University of California.

‡Aided by grants from the Board of Research, University of California, the American Dental Association and the Pacific Orthodontic Research Fund.

velopment of the permanent tooth; second, a *nondevelopment* of the permanent tooth; third, *malposition* of the permanent tooth, resulting in its subsequent eruption in some location other than its normal one; fourth, *malposition* of the permanent tooth which makes it *impossible* for it to *erupt*, and finally, the *death* of the *pulp* in the deciduous tooth.

The process of resorption was studied quite extensively by the elder Tomes,[1] and our present knowledge of the subject has not been significantly enlarged since then. He pointed out that if a deciduous incisor is extracted in a child four years of age, there will be found small excavations, erosions, or resorptive areas upon the *apex* and *sides* of the tooth. However, it is not an uncommon occurrence to find these areas on relatively remote locations. For example, upon the periphery of roots of first and second deciduous molars, the crown of the succedaneous tooth develops between the roots, but the resorptive areas, although usually found upon the root surface adjacent to the forming tooth, are also demonstrable upon outer aspects of the root.

Beginning in the cementum the loss of tooth structure progresses into dentine and may even attack the enamel. Coincidentally with the loss of cementum, a resorption of the dentine occurs along the walls of the root canal. This portion of the process was evidently not studied by Tomes, for he says, "that part of the dentine which immediately surrounds the pulp in deciduous teeth, appears to have more power of resistance than any other part of the tooth, and thus often persists for a time as a sort of hollow column." I have found in some of my sections[2] that the Howship's lacunae progress outwardly from the pulpal wall. They progress toward the area where active resorption of both cementum and the outer portion of dentine is occurring. In order that this process proceed normally, the pulp must retain its vitality to the last, and it is a severing of the fine nerve fibers in the pulp which accounts in part for the little twinge of pain experienced by children when the deciduous teeth are extracted.

In addition to the loss of tooth structure, the walls of the alveolus immediately surrounding the roots of the deciduous teeth are resorbed, thereby making adequate space for the larger permanent teeth. The agencies which have been held responsible for the shedding of deciduous teeth, have been discussed in another place,[3] but suffice it to say that we are yet in the dark as to all of the factors concerned.

The greatest objections raised have been directed at the theories of pressure, for not only in man, but in lower animals, are there many instances where it is very doubtful that pressure of the erupting tooth exerts any influence whatever on the processes of resorption. To what extent, therefore, may we assign mechanical stress produced by orthodontic bands to the process of resorption?

Absorptions of permanent teeth due to both infective and noninfective processes are illustrated almost daily in the clinic. But the reaction of these teeth to absorptive processes exhibits certain characteristics which will be discussed later in greater detail. Suffice it to say that they present quite a different picture from that which we see in the physiologic resorption inci-

dent to the normal exfoliation of a deciduous tooth and eruption of its successor. There is another undetermined factor also in cases of *malposition* of the unerupted teeth; there may be either little absorption or *considerable.*

A microscopic study of resorbed roots of deciduous teeth was presented before this society a year or so ago. At that time figures were shown which demonstrated Howship's lacunae on both sides of the root; that is, progressing from the pulp *outwardly* and from the *cementum inwardly.*

When the cross-section of a normal tooth and its alveolar tissues is studied, we find no evidence of an osteoclastic or cementoclastic action so characteristic in cases of resorption.

There are, apparently, three sets of cells taking part in the shedding of deciduous teeth, cells which differ more in their *location* in the tissue than in their morphology or function. It is probable that the *osteoclast* starts the process by commencing to open up the alveolar wall. At the same time the *cementoclast* operating from the peridental membrane, commences to absorb the cementum. At a somewhat later date, the *odontoclast,* stimulated into action, commences to enlarge the root canal and to produce irregularities therein. These stages I have demonstrated by slides and models.

One can hardly help drawing a comparison between some of the bone changes incident to the loss of deciduous teeth and bone atrophy occurring in the extremities under certain conditions. However, it is to be pointed out that carbon dioxide has been shown to be a *solvent of lime salts.* Lymph is certainly comparatively rich in *carbon dioxide.* Applying this hypothesis to the tooth roots, it is quite possible that a venous congestion occurs in and around the maxilla and mandible during tooth movement. In fact, I have seen several statements in literature to the effect that an hyperemic mucous membrane is not an uncommon symptom associated with orthodontic treatment. Hyperemia means an increased flow of blood and lymph to the part. Therefore the changes in the blood supply due to these hyperemic conditions may be responsible for the breaking down of both tooth and bone structure. Triepel,[4] and others, have shown also that osteoblasts and osteoclasts maintain a balance between anabolism and catabolism of bone.

The latter cells, the osteoclasts, which morphologically are practically indistinguishable from osteoblasts, wander from place to place as they are called upon to render service. If, due to some peculiar irritation, or stress, an accumulation of osteoclasts in one locality occurs, bone resorption may follow. Such a stress may conceivably be produced in tooth movement.

There are one or two points of interest which have impressed themselves upon me while studying sections of several teeth submitted during the last eighteen months by Dr. Ketcham.

For purposes of discussion we may assume that the loss of deciduous teeth is a physiologic process, whereas the *erosion* or absorption of the apices of permanent teeth, when related to apical infection, is a pathologic one. I propose to discuss these two conditions and in a subsequent paper to compare them with the resorption of teeth following orthodontic treatment. I

think that when these two processes are clearly differentiated, we will be able to evaluate more fully the possible significance of "orthodontic resorption."

A set of figures* has been made from a mandibular left deciduous canine from a patient of Dr. Ketcham, Donald P., aged ten. The root was almost completely resorbed. I have had prepared a wax model of the tooth which brings out rather strikingly the extent of tooth loss as it is seen in the microscope, and as it is reconstructed by camera lucida drawings. This model gives merely tooth outline and pulp cavity outline, but does not demonstrate the honey-combed structure of the dentine which is seen in the microscope. The point of particular interest is that the process has been going on at a comparatively rapid rate. Apparently every effort has been made to hasten things up and thus get rid of the tooth as soon as possible.

The root has been resorbed by two different tissues. First, the peridental membrane was stimulated to an extent necessary to excite the osteoclasts or the cementoclasts to action. As a result the cementum in the vicinity of the apex was eroded. With the continuation of the impulse responsible for the initiation of the resorptive process, the cementum higher up on the tooth was attacked. Soon the rather thin covering of cementum was penetrated and the peridental membrane came into contact with dentine. Probably at this point the odontoclasts in the pulp commenced their work so that here we see in progress a burrowing similar in some respects to the building of a tunnel. One crew is at one end of the tunnel, the outer layer of the cementum, and the other crew is at the other end of the tunnel, the periphery of the pulp canal. The two are working toward each other so that a connection may be established. When this is accomplished the tooth is loose enough to be extracted with the fingers.

As a result of the two processes, the whole root structure is honey-combed with relatively large spaces which communicate between the pulp and the peridental membrane. The Howship's lacunae are demonstrable in several areas.

The next point to be discussed deals with the pathologic apical absorption of permanent teeth. During the last few years I have received from many sources specimens of this type of lesion. Among these are several from Dr. Ketcham. On account of their peculiar interest and the typical microscopic picture which they present, I have prepared several illustrations from them. The first is a specimen from a woman thirty-five years of age, who gave the following history: She had a severe attack of inflammatory rheumatism at twelve years of age and described a high temperature lasting a month. As a result of the inflammatory rheumatism, she was left in such a crippled condition that she had to learn to walk all over again. This specimen, a premolar with an incomplete root canal filling has certain outstanding characteristics at variance with those of the deciduous teeth.

In this instance another type of stimulus has brought about the activity of the cementoclasts. Following *partial* necrosis of the pulp, the canal was

*These were shown at the meeting but are not reproduced here.

only half filled. In such a case, we would not expect to find any activity on the part of the odontoclasts. The wax model presents a picture entirely different from that of the first one. This tooth did not respond favorably to pulp canal treatment. The process is much slower and the cementoclasts and osteoclasts are the only tissue destroyers concerned. The cementum in some areas has been entirely eroded, leaving exposed dentine in apposition with the pathologic peridental membrane. There are even portions of the root where no cementum is demonstrable and where the peridental membrane has invaded the dentine, producing quite marked irregularities characteristic of absorption.

Finally, may I point out that these models and slides of specimens and of tissue preparations show the outstanding differences between the *physiologic* resorption in the roots of deciduous teeth and the *pathologic* process occurring at the apices of the infected root canals in permanent teeth. At another time I hope to be able to draw further comparisons which will include studies of teeth *extracted during the course of orthodontic treatment.*

This point, I think, should be kept clearly in mind: That partial absorption of permanent roots is not an uncommon process even in mouths where no orthodontic treatment has been conducted. That it occurs in cases of orthodontia is interesting, but that it is *not* demonstrable in *all* cases of orthodontic treatment is even *more* interesting. Let us not be hasty in reaching conclusions nor in forming judgments until all the data are at hand.

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ORTHODONTIA FOR THE GENERAL PRACTITIONER*

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I REALIZE that any phase of the subject of orthodontia is difficult to present before a body of general practitioners or those interested in other specialties of dentistry. The manner in which we all select the subjects which are most interesting to us is perfectly natural, and relate to those things which are either most productive in our work or are of greatest personal inspiration.

Ages ago it was observed that teeth would move. If a tooth were extracted the adjoining teeth would drift together. If teeth were absent from one arch, those in the opposing arch would elongate. It was observed that mouths were undergoing constant changes in form and that certain characteristic forms of irregularities would be produced in different individuals as a response to certain apparent influences, such as habits, mouth-breathing, etc. On this vague hypothesis dentists realized that if teeth moved without any mechanical interference, they could be moved with appliances, and thus the great science of orthodontia sprang from a very obscure origin. So far as the teeth and the vital tissues surrounding them were concerned, the assumption of movement was based upon the elasticity of bone, in the belief that if excessive force was applied, teeth could be pressed into more desirable positions and held sufficiently long until the tissues would again become passive and the teeth remain in their changed positions. All of this work was experimental and uncertain, fraught with the difficulties of every individual case, generally inviting failure or incurring a degree of damage from which mouths never recovered.

Orthodontia has undergone a vast change. Conditions are entirely different today, and figuratively speaking this old original structure of early thought in orthodontia has been elevated to a height, so that beneath it there have been excavated and laid the deep foundations of fundamental background and scientific reasoning, on which the superstructure of orthodontia of the future may now be securely built. It has been my observation and belief that simplicity of thought and action ultimately prevail in every branch of the sciences which deal with the healing arts when they approach perfection or are mastered.

The premise of orthodontia should be the same as in every subject in medical science, namely, that in the production of effective results the operator would be intimately familiar with the normal conditions within his field from the point of view of the origin of the tissues, their production, and development to the extent of the completed result of growth. Following an intimate

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Read before the Virginia State Dental Society, 1927.
Read before the Dallas Mid-Winter Clinic, 1929.
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knowledge of what is normal about the teeth and jaws the next step in progressive thought should be to recognize those factors which upon invading the regions about the mouth stimulate the vital forces to operate adversely in the production of objectionable conditions. At this juncture the trained mind should be capable of such keen perception as to be able to give Nature the proper benefit of doubt, as well as to perceive the proper time when Nature requires assistance. If this is done and facts indicate that assistance is required, then treatment indicated should be considered in the terms of lending Nature the degree of aid required at the proper time, of the right kind, and in an amount sufficient but no more than is actually necessary.

My aim in presenting these few thoughts to your minds is to bring forth the realization that the movement of teeth in order to be effective must be recognized as a definitely prescribed therapy. When the physician writes a

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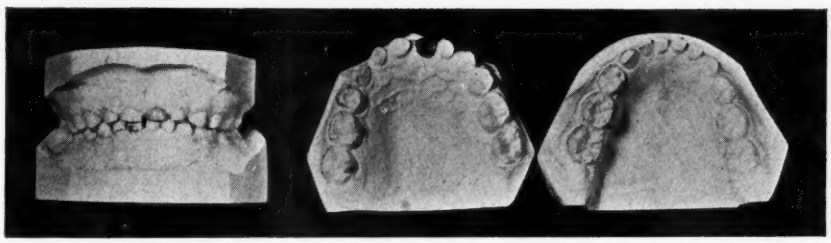

Fig. 3. Fig. 4.

Fig. 1.—Normal occlusion of patient five years old.
Fig. 2.—Occlusal view of same case. (L. M. Gunton.)
Fig. 3.—Normal occlusion of patient six years old.
Fig. 4.—Occlusal view of same case. (L. M. Gunton.)

prescription for the administration of a drug, that is his expression of an agent intended to remedy some functional or organic disturbance. When the surgeon removes an appendix, that is a definite act of assistance in aiding Nature by the removal of an appendage which has become seriously involved.

Orthodontia, in common with all other highly differentiated fields of specialized study, has undergone many changes in its evolution from its earliest beginnings. These have come into being as an expression of natural progress and a normal outgrowth of experience as well as in consequence of the broader extension of knowledge in other and related fields of endeavor.

Orthodontia is defined as that science which has for its object the correction of malocclusion of the teeth and the surrounding structures. Therefore, when we study malocclusion of the teeth and maxillary deformities in the light

of the science of biology, orthodontia is to us then the branch of dental science which treats of the functional nature of the dental apparatus as a whole and of the laws which underlie its growth and development.

The practice of orthodontia is a part of the healing arts. Its purpose is neither to make the dentures of all people conform to one definite mathematical formula of proportion nor to realize in all instances a definite scheme of relations for each individual tooth of the dental arch. The purpose of orthodontia is to assist nature in the development of the structural elements of the jaw and so to harmonize the surrounding and supporting structures of the teeth that the whole mechanism will constitute an assemblage of parts best suited to the functional activities.

Normal occlusion of the teeth is the condition of tooth relations that is most effective in maintaining and establishing in its most stable form the or-

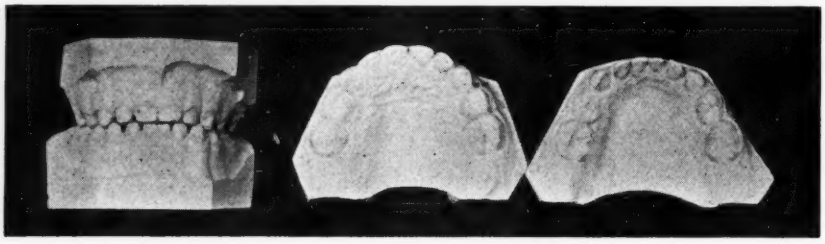

Fig. 5. Fig. 6.

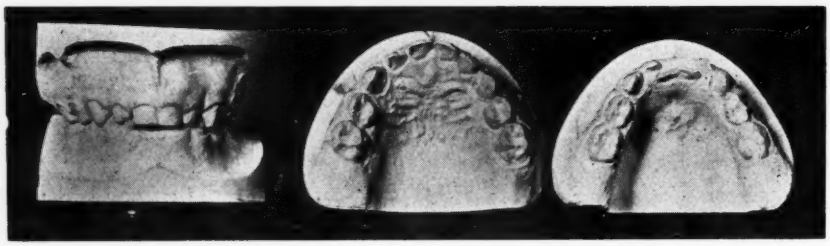

Fig. 7. Fig. 8.

Fig. 5.—Case of neutroclusion of patient five years old. Case should be kept under observation.

Fig. 6.—Occlusal view of same case. (Joseph D. Eby.)

Fig. 7.—Case of neutroclusion of patient five and a half years old. Case should be kept under observation.

Fig. 8.—Occlusal view of same case. (Joseph D. Eby.)

ganization of the living being. Typical occlusion indicates in a general way the extent of variation of structural relations that in ordinary circumstances should be accepted as normal. At the present state of our knowledge we are without means of ascertaining the interaction of occlusal phenomena with other vital processes of the organism. Our concept of type is the best index we have for normal.

Naturally in connection with malocclusion one thinks of defective mastication, mouth breathing, and finger or thumb sucking, but in addition there are various malformations or habits of lips, cheeks, and more particularly the tongue, which are sometimes overlooked. Any of the abnormal functions mentioned may be a cause of maloeclusion, whether primary, secondary, or con-

current, or it may be a result. It may consist of an insufficiency or a perversion of function. In all cases it is indispensable that such conditions be corrected as well as the malocclusion if permanency is to be secured.

In order to establish a desirable position of the permanent teeth it is necessary that children be placed early in life in the hands of those best qualified to judge when expansion of the deciduous dental arches is necessary. Very frequently the orthodontist is told by the parents that their dentist advised that nothing be done until all the deciduous teeth are lost and that when this period of development has been reached and the dentist again consulted relative to the case, the parents are now told that the child is too old to have the malocclusion corrected.

We all know that the deciduous dentition is far more likely to develop into a normal relation than is the permanent, but it must not be assumed that mal-

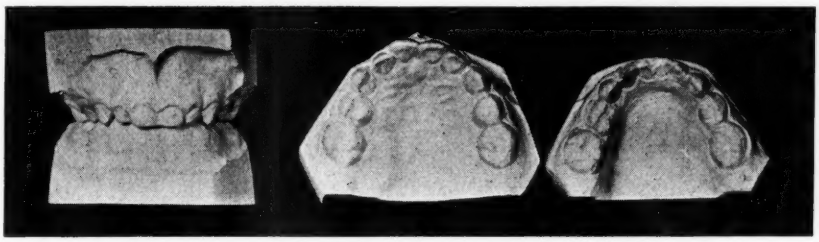

Fig. 9. Fig. 10.

Fig. 11. Fig. 12.

Fig. 9.—Case of neutroclusion which should be treated. Patient five and a half years old.
Fig. 10.—Occlusal view of same case.
Fig. 11.—Neutroclusion of patient five and a half years old, case should be treated.
Fig. 12.—Occlusal view of same case. (L. M. Gunton.)

occlusion is never found in the deciduous dentures; in fact, all forms of malocclusion are found in the deciduous dentures, and in many of them treatment should be begun prior to the eruption of any of the permanent teeth.

Modern dentistry teaches prophylaxis and scrupulous care of deciduous teeth as well as of permanent teeth. He who advises parents to let the deciduous teeth alone and that it is useless to treat deciduous teeth, simply because he dislikes children's work, is guilty of the grossest malpractice and works untold injury upon suffering humanity. Much can be done to prevent decay and premature loss of these teeth.

The insertion of an orthodontic appliance in the mouth is at best the mechanical expression of a means of assisting Nature under circumstances wherein the brain and hands of man are capable of rendering aid. Woe be unto

the exclusive specialist in orthodontia and the general practitioner alike who, through ignorance or empirical methods, will fill a mouth with mechanical devices without an intelligent knowledge of cause and effect, thereby subjecting a fellow human being and a worthy science to irreparable abuse and damage!

While the scope of orthodontia has grown to an extent as to require practically the entire time of an individual and has established itself in the position of an exclusive specialty, it cannot be said that its requirements are as yet being completely met. It is not a question of what the specialist wants, or what the general practitioner wants, but it is the public demand to which we all must respond. The expense and duration of orthodontic treatment, as well as the necessary mental and physical equipment for its intelligent practice,

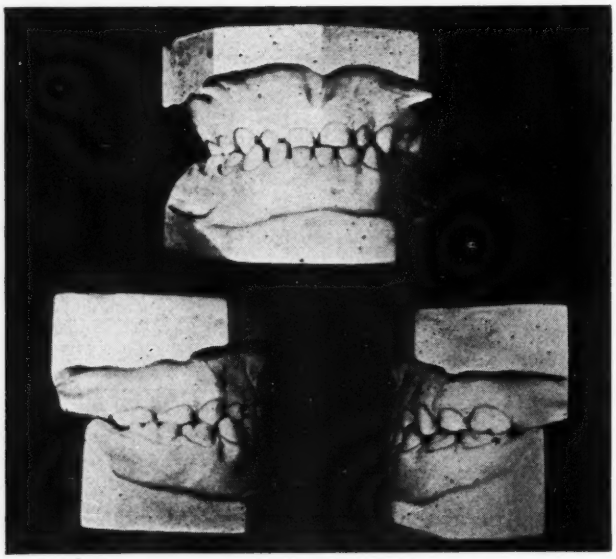

Fig. 13.—Neutroclusion case of patient five and a half years old; the teeth on the right side of the maxillary arch are lingual to the teeth in the mandibular arch. This case should be treated.

have greatly limited the scope of its service, and herein is the great problem with which undergraduate and postgraduate education and the science of dentistry at large will have to cope in the future. The progress which orthodontia is making today is gradually solving the problem, and the time is not far distant when the recognized types and uses of appliances, as properly mastered, will further enlighten this obscure question and broaden the scope of effective service; as this is accomplished, the public at large will not only recognize the value of the specialist but will naturally demand more of the general practitioner in the effective correction of the malocclusion of the teeth of the coming generations.

The general practitioner cannot divorce orthodontia from his work as it pertains to his community, and the progressive dentist is impelled to take the subject of orthodontia very seriously for his own sake, as well as for the sake of his assumed obligation. The first phase of orthodontia which every intelligent dentist should practice alertly is preventive orthodontia.

Diagnosis means the recognition of disease from symptoms and signs.

Treatment is secondary to diagnosis. From the standpoint of orthodontia the diagnosis of malocclusion of the teeth of a child means the recognition of tooth relations that are probable hindrances to normal development. The difficulty in the question of early treatment is not one of treatment but of diagnosis. Whenever we recognize a condition which interferes with normal development, it should be corrected; there is no question of the time of treatment when such conditions are known to exist. The great problem confronting us is to recognize the presence of such conditions.

Deciduous teeth are important structures. They are as much a part of the organic complex and have as definite a place in the evolution of the individual organism as the permanent teeth. The deciduous teeth function at the time when growth and differentiation of structure are most rapid. They function

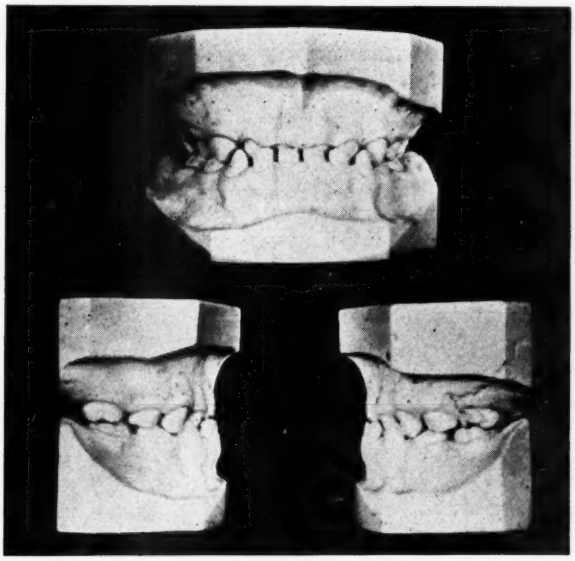

Fig. 14.—Case of neutroclusion in which the incisors in the maxillary arch are lingual to the incisors in the mandibular arch. This case should be treated.

at the time when the organism is particularly susceptible to formation of both good and bad habits, and they often influence the eruption of the permanent teeth and the development of the dental arch as a whole.

The care of deciduous teeth means more than to preserve them by prophylaxis and filling. The care of deciduous teeth may mean extracting them at the proper time as well, and this is quite as important. Too long retention of any of the deciduous teeth may be the determining factor in the development of malocclusion. It is imperative that they be removed when developmental conditions indicate. It is particularly necessary to watch the mandibular second deciduous molars. There is no general practitioner who by necessity should extract a deciduous tooth prematurely without taking radiographs to note the location of the permanent successor, and provide a simple appliance known as a space-retainer to prevent the migration of the adjacent teeth and the formation of a most damaging type of malocclusion. The second phase of preventive orthodontia relates to the filling of the smallest fissure and pit defects both in the deciduous and permanent teeth. The knowledge of the effects

and the control of habits which produce malocclusion are responsibilities which belong almost entirely to the general practitioner, because these conditions are generally in existence before the services of a specialist are sought for the treatment of the effect, rather than to deal with the cause.

In realization of the fact that the succession of the deciduous denture by the permanent teeth is effected by a very intricate process it is safe to venture the assertion that the majority of malocclusions of the teeth become apparent between the ages of four and eight years. In this complex process of Nature the fine order of things is most frequently broken at that time, and when the error occurs and Nature's train has jumped the track, it is far better to place her back on her own schedule at that time than it is to allow increasing complications to heap up to the point of the production of a serious or extensive condition.

In the consideration of the preventive value of early treatment, it is not to be said that every slight deviation between the ages of four to eight should

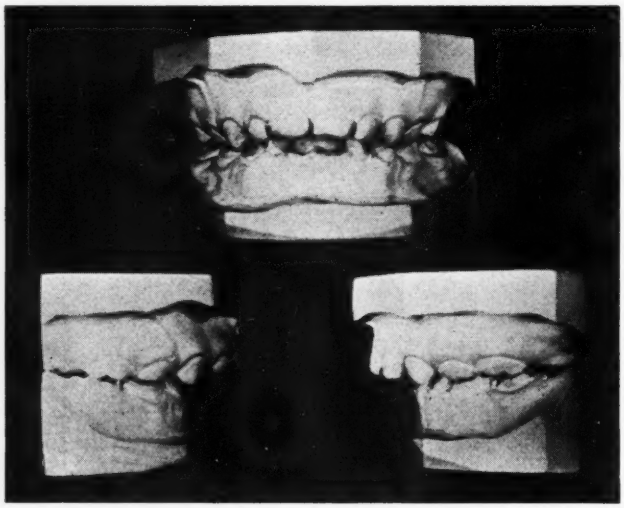

Fig. 15.—Posterior occlusion of patient four years old. Maxillary arch very narrow, mandible very much underdeveloped. This case should be treated.

be immediately attacked by the use of appliances. This is where those logical thoughts which pertain to giving Nature a reasonable benefit of the doubt should enter. It very frequently becomes just as serious a responsibility not to treat at a certain age as it does to treat; and if treatment is attempted which is not indicated, it is just as great a mistake as it is not to interfere when treatment is indicated. Dr. Milo Hellman has pointed out the fact that the head grows downward and forward, broadening out as infancy progresses into maturity. A profile outline of a newborn baby's head when superimposed over a similar drawing of the adult head would rest within the cranial cavity. When it is realized that this extensive transposition of teeth and tissue is in constant progress, it is with grave danger that early treatment is approached without most definite assurances of its necessity.

On the other hand upon observing advanced conditions of malocclusion it is only to regret the fact that the preventive value of early treatment, as it was indicated at the proper time, had not been instituted. Therefore, it be-

comes the grave responsibility of the general practitioner and in time to come a serious indictment against him for allowing extensive malocclusions to develop which were under his observation at the time when a little bit of early treatment was indicated.

Since it is realized that the principal business of childhood is growth, and inasmuch as we are committed to the task of assisting in this process only when required, it should be the duty of every dentist to possess an accurate picture of the changes as they are taking place constantly in bone. In childhood the corpuscle scarcely becomes an adult cell before the nucleus divides, the cell wall constricts, and two cells are thus produced. This process continues into old age under the varying condition that it becomes slower and the cells drift further apart, increasing the intervening areas of calcium phosphate and other inorganic constituents. This constant interstitial proliferative process renders bone subject to flow in the direction in which successive stimulation

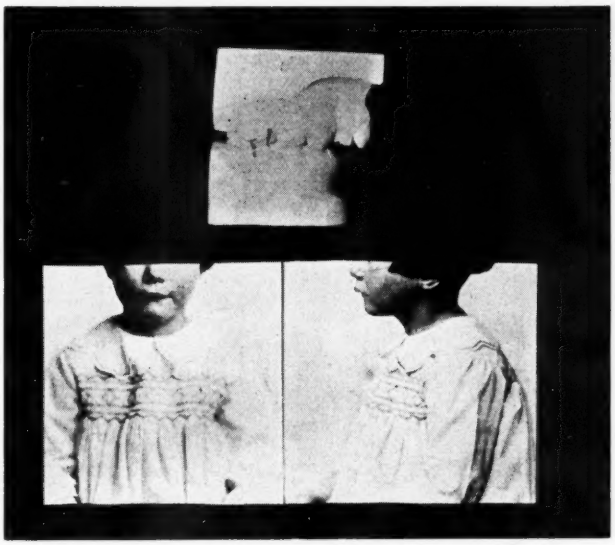

Fig. 16.—Posterior occlusion in which malocclusion may have been congenital or may have been caused by sucking the thumb. The suction caused narrowing of anterior parts of dental arches while leverage of thumb tends to carry mandibular arch and mandible into retruded position. Facial photograph shows tendency to lip biting or sucking in absence of thumb. (Lloyd S. Lourie.)

is borne against it. This single vital force is unconscious of the influences to which it may be subject, whether it be through faulty function, as in mouth-breathing, abnormal occlusion, habits, or orthodontic appliances. A plant may be entirely drawn out of shape in its growth as attracted by the sun. You would not consider bending or breaking such a plant to straighten it up. You would naturally turn it around. This comparison is quite favorable in the consideration of the subject and the design of appliances for the movement of teeth and the transformation of bone.

At this juncture it must be realized that metabolism, as it relates to childhood, plays a very important part. Little is known about calcium metabolism. The sources of calcium phosphate are known and are included in such articles of diet as milk, whole grains, vegetables and fruits. It is known that no more than one-third of the actual volume of calcium taken into the system is di-

gested, assimilated and distributed in the form of bone and tooth building material. But upon the delivery of this building material the formation of teeth and bone depends. It is therefore safe to say that we should include in our work knowledge of diet and function which goes to produce a physically hardy individual and assure the delivery of the working materials upon which we are dependent.

The most assured natural law is that of variation. If there could be given five cases of identical malocclusion in children of the same age who could be treated with identical appliances, it would be safe to assume that one would respond the best, one the least, with the other three in between. This condition which relates largely to actual physical variation is due to the inherent or basic cell chemistry of the individual and his rate of calcium metabolism.

Dr. John V. Mershon defines functional relationship in this way: "While we are moving teeth from their positions of malocclusion to normal functional

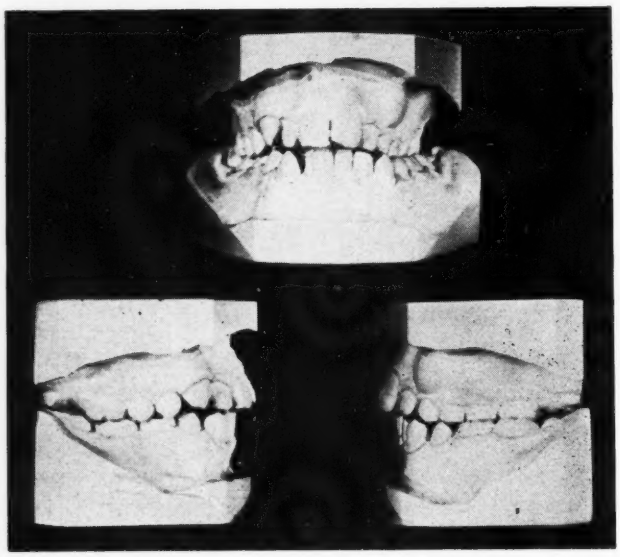

Fig. 17.—Neutroclusion of boy twelve years old, showing teeth on left side of maxillary arch lingual. This case should have been treated at an earlier age.

relations, the tissues surrounding and supporting the teeth will so adapt and adjust themselves through an interaction of forces that the proper equilibrium between teeth and tissues is maintained during the whole process of tooth movement. Appliances are effective in proportion as they apply force in the direction of normal growth and in so doing do not interfere with the function of any of the tissues associated with the teeth or with the teeth themselves collectively or individually, each tooth being free to function normally."

An appliance that conforms to physiologic requirements in every detail would be ideal, but as yet there is no ideal appliance. All types of appliances thus far devised have some admittedly bad features, and successful orthodontia is not altogether due to the appliance employed.

Orthodontia depending entirely on the appliance often comes to grief in its ultimate results. In the past, orthodontia consisted in aligning irregular teeth. Now we believe we are treating oral deformities that partially or wholly

interfere with normal function. In the past the object in view was to push or pull teeth into position in the quickest way, regardless of tissue changes and functional phenomena. Now we understand that no mechanical device can make an absolutely perfect occlusion. Limitations are imposed by the size and shape of the teeth and the growth phenomena of associated structures.

No appliance working alone can accomplish the ultimate good sought. A proper appliance should be only a stimulus to supporting tissues of the tooth by pressure applied to it. It should work in conjunction with and at the same time in opposition to the natural stimulus of growth going on in these tissues. The dental arch as a part of the individual and the stimuli of the appliance and natural growth must be reconciled, the appliance being the controlling factor.

The rapidity of the work of the appliance must also be limited, as the teeth must not be moved faster than the normal functional processes will per-

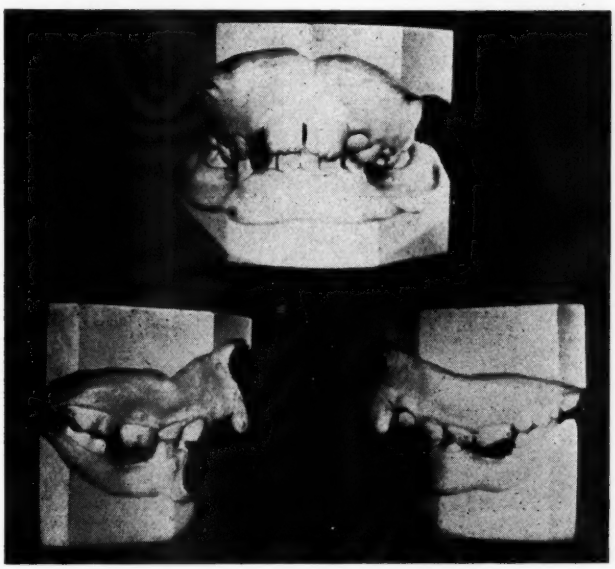

Fig. 18.—Posterior occlusion with the teeth in the maxillary arch very narrow, and the anterior protruding. The mandible very much underdeveloped. The premolars in the mandibular arch coming in lingual, also insufficient space between the first molars and canines for premolars.

mit, even though the appliance works continuously in the opposite direction. Normal growth, if given a chance, will usually accept part of the burden of developing normal occlusion.

Referring to our definition of an ideal appliance, we find that it must: first, exert pressure on the malposed teeth; second, that it must alter cell metabolism; and third, that it shall cause the teeth to assume their proper positions and relations. Only as a result of the accomplishment of the first and second can the third be obtained. If only one of these three requirements existed, there would naturally be less possibility of bad features arising. Not only does the threefold function of the appliance lead to various types of conditions, but we find that the environment in which the appliance is to be used tends to develop bad features. The appliance should be capable of withstanding the abuse due to mastication and the use of the brush.

It must be remembered that the amount of space available for the application of appliances is sometimes detrimental to the construction and design of the appliances. The space in the oral cavity is necessarily limited, and the lips and the tongue will not tolerate bulky devices.

The first of the bad features of appliances to be considered is that in designs built along lines of efficiency, the appliances must be constructed according to standard mechanical principles in order to be a success. But the question of efficiency is influenced by conditions which now must be related to another feature that is determined ultimately by physiologic phenomena; for example, take the question of the stability attachment, a good feature but sometimes classed as a bad one. Many otherwise efficient appliances have been rendered useless because of insecure attachment to the malposed teeth and also to the anchor teeth.

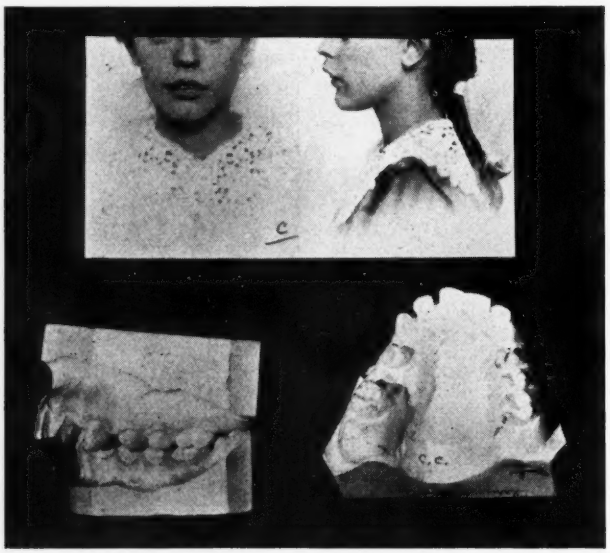

Fig. 19.—Still practicing thumb-sucking at the age of thirteen. Apparently no other cause for deformity. Models show neutroclusion case. Thumb-sucking with protrusion of maxillary anterior teeth. (Lloyd S. Lourie.)

The general practitioner should feel the sense of responsibility sufficient to master the early diagnosis of malocclusion. No doctor should be above consultation, and in the more difficult cases the services of a specialist should naturally be sought with the one aim in mind at all times, that a maximum improvement and the least possible damage to the patient be done.

After teeth have changed their positions as the result of the stimulation from the appliance and are no longer subject to this stimulus, pressure should not again be applied to the teeth for a considerable length of time, varying, of course, with the rate of growth and changes which are taking place in that particular individual. The reason for this is that after the appliance has ceased to be a factor, the teeth continue to change their positions in the direction which nature originally designed they should move, and they can better adapt and adjust themselves in this process of natural movements than we can possibly do with our appliances.

There should be several periods during the treatment of a case when the

mouth should be entirely free of appliances. The general concept of moving teeth from positions of malocclusion and then having the patient wear some form of retaining device to hold the teeth in position is an acknowledgment of the fact that we have produced this change in tooth position in such a way, either by speed of treatment or method of tooth movement, that a disturbance in functional relationship has been established, and that it is necessary to hold these teeth in the positions until functional adaptation can re-establish itself.

The opinion seems to be prevalent in orthodontia that because bone will change in response to mechanical stimulus and because the orthodontic appliance is the accepted means of producing stimulus, this change is compatible and in conformity with normal growth processes, and if teeth are held in a certain position by some form of retaining appliance after they have been moved from their position of malocclusion into a position of normal occlusion

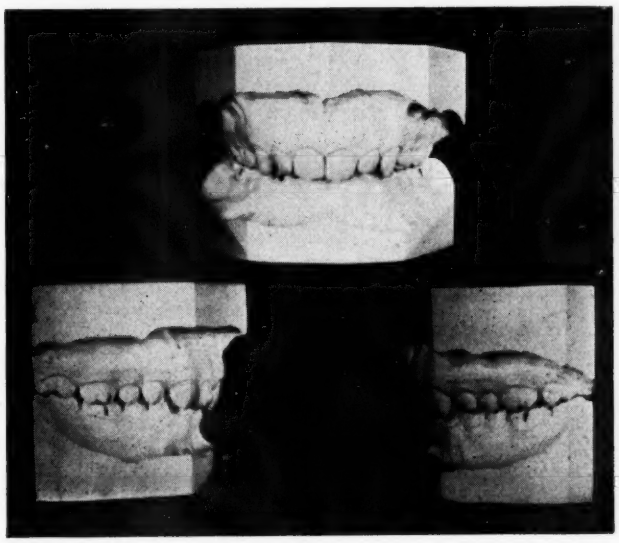

Fig. 20.—Posterior occlusion with excessive overbite. Anterior incisors of maxillary arch coming into occlusion on gingival margin of mandibular teeth. Also incisors in mandibular arch biting into soft tissue of maxillary arch.

and held long enough, they will eventually become adapted to this new position. That this theory is incorrect has been proved by the fact that very few cases ever remain in the identical position that they were left when the retainers were removed, and in a very large percentage of cases the change in the position of the teeth after the retainers have been removed is very great.

It is my belief that tooth movement can and should be accomplished in such a way that functional relationship will not be disturbed and that this period which we term the retention period should not exist. The very thought of it presupposes a disturbance in function which, of course, means a disarrangement in tissue.

If malocclusion is the result of the perversion of function and of the disturbance in function of the different associated tissues, why is it not reasonable in undertaking to correct malocclusion with orthodontic appliances, that we should endeavor to avoid further unbalance and disturbance of this functional relationship by the use of appliances.

In treating a case of orthodontia there are three thoughts we should always keep consciously before us. The most important is, how much damage is possible to be done by placing appliances in the mouths of children? This reminds me of what a noted internist said regarding the writing of prescriptions. He said after he had written a prescription he always read it over with this question in mind, "Is there anything in this prescription which can possibly do the patient any harm?" This would be a very good plan for the orthodontist to follow, for orthodontic appliances can do harm; they do do harm.

The next question which we should ask ourselves is, How much is the normal process of growth inherent in the human organism going to do toward correcting this case if we do not touch it? I have seen many children grow into manhood with many surprises as the result of Nature's efforts.

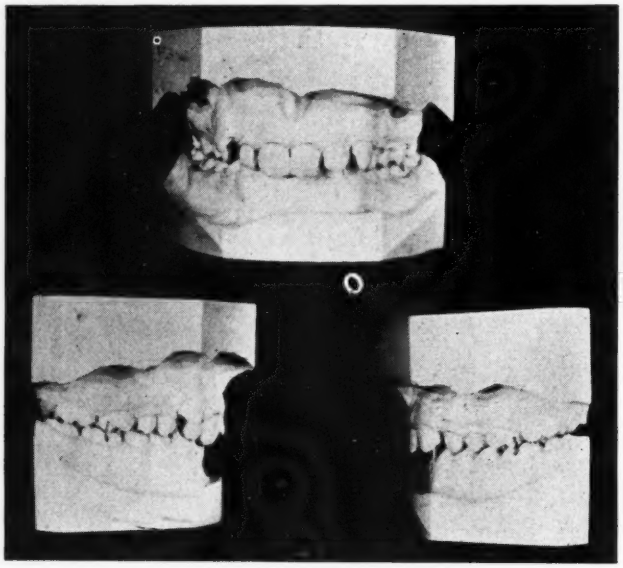

Fig. 21.—Showing the exact condition of Fig. 20. with the exception of there not being room in the maxillary arch for the right canine.

The general plan of diagnosis partakes of three phases, the shape of the maxillary arch, the shape of the mandibular arch, and the relations between the arches. It can be readily assumed that normal is a highly individual affair. The variation in the volume of tooth substance as well as facial outline is such that no mathematical rearrangement of the order of teeth can be recognized as a formula to apply to every individual. There are a few landmarks, however, which should be recognized as constant in every individual mouth. The maxillary canines are a very important factor in expression and should occupy position of angular prominence at the corners of the mouth. Beginning with the canines the posterior teeth should diverge on straight lines uniformly backward. With these points given, the first law of arch form then becomes the fact that there would be enough room between the two canines for the four incisors.

If there is a discrepancy in one of the lateral divisions of the posterior teeth, such as an interlocked second premolar, this condition should generally

be straightened up first, so that the rest of the arch form, when it comes to expansion and the study of occlusion, can be rendered uniform across both sides of the arch. Following expansion the final steps relate to the alignment of the anterior teeth. This plan of study applies to the mandibular arch as well as to the maxillary arch, and the assumption that the nearest state of symmetry out of which an irregularity can be brought must be very close to normal for the individual. Unless the maxillary deciduous teeth have been lost prematurely, it is reasonably safe to assume that the maxillary six-year molars occupy a generally constant relation within the skull, although this cannot be invariably relied upon. In diagnosis, so far as the horizontal position of the mandible is concerned, it is safe in the majority of cases to study the relation between the maxillary and mandibular first molars. If the mesio-

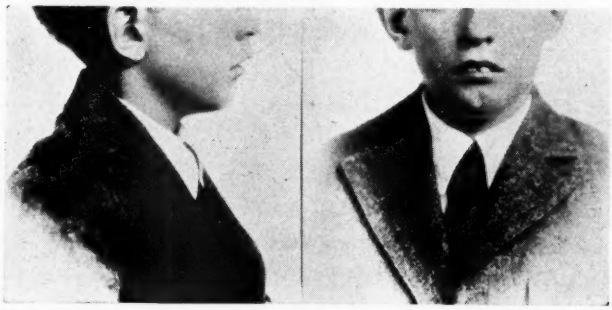

Fig. 22.—Neutroclusion mouth breathing with abnormal lip function. (Lloyd S. Lourie.)

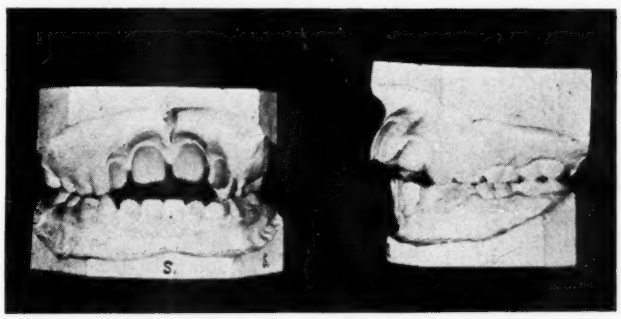

Fig. 23.—Facial deformity does not necessarily accompany thumb-sucking. The models of this case show typical neutroclusion. This is an open-bite case.

buccal cusp of the maxillary six-year molar occludes fairly well within the buccal embrasure of the mandibular six-year molar, it may be safely relied upon that the mandibular is neither anterior nor posterior to normal. If such a state exists and treatment is only indicated for the maxillary and mandibular arches individually, such a case is generally recognized as a state of neutroclusion, and governed by the backward or forward position of the mandible; the condition may be recognized as a posterior occlusion or an anterior occlusion. In these the use of intermaxillary force in the form of elastics or inclined bite planes is needed in order to shift the occlusion into correct relation.

The routine of study and preparation for the diagnosis and treatment of a state of malocclusion should be to examine the patient carefully. First, see

that the teeth and gums are placed in perfect condition, and they are to be maintained so throughout treatment. Following this, suitable study models should be made from accurate impressions. In the study of these models it is of supreme importance that we have a complete x-ray examination of the mouth. This has been conclusively proved in my practice of orthodontia and substantiated by the experience of other specialists for the following reasons:

We find constricted arches which are inexplainable in which x-ray examination discloses supernumerary teeth, which are nearly always confined to the maxillary anterior teeth and third molars. Missing maxillary laterals, canines, premolars, as well as first, second, and third molars are disclosed.

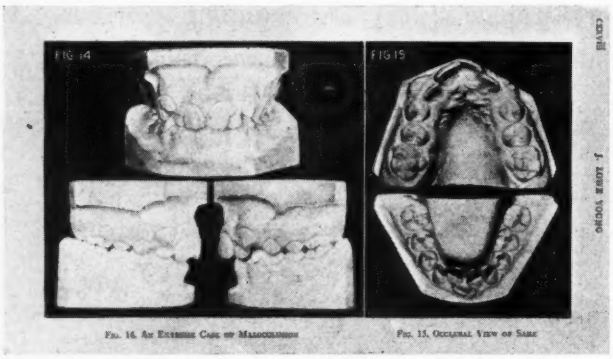

Fig. 24.—An extreme case of posterior malocclusion. Both the maxillary and mandibular arches are narrow in the premolar and canine regions. There is no room for the canine in the maxillary arch, and the central incisors are completely crowded out in the mandibular arch. (J. Lowe Young.)

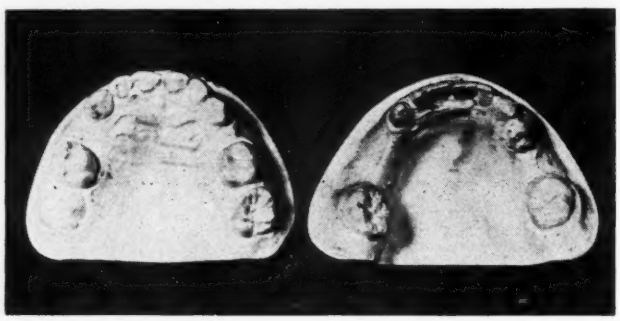

Fig. 25.—Models showing use of space maintainer which holds the space for permanent teeth.

Missing mandibular centrals, laterals, premolars, and first, second, and third molars are also disclosed.

We are also able to determine the position of maxillary anterior teeth which are sometimes separated due to an enlarged frenum. In these cases we are able to determine the advisability of the surgical removal of the frenum. This is contraindicated when demonstrated there is a lack of development of the alveolar process at the line of union of the alveolar process of the palatal bone. Likewise, we are able to determine the approximate mesiodistal development of these teeth, that is to say, the width of the teeth. We are enabled to determine the absorption of the roots of the deciduous molars, and in some instances we can clearly demonstrate the absorption of one root and the lack of absorption of the other root. This particularly applies to the

mandibular molars, and in these cases the extraction of the deciduous molars is undoubtedly indicated. Otherwise, we have a deflection of the permanent tooth either lingually or labially in accordance with the absorption of the root or roots.

We get a comparative study of the approximate width of premolars as compared to anterior dimensions of the permanent molars. This will determine the advisability of permitting the first permanent molar to drift forward slightly to establish normal contacts between the first permanent molar and premolars. Likewise, we often demonstrate the impossibility of the eruption of the maxillary canines, principally due to impaction.

Very often we find the second molar elongated beyond the occlusal plane of the first permanent molar due to the pressure of the third molar in the process of erupting, which is definitely demonstrated as an impaction, and there is no question as to the advisability of early removal of these impacted teeth with the least possible damage to the alveolar process on the posterior surface of the second molar. In this treatment we will find the minimum absorption and feel assured that we will have a second molar properly encased on the posterior surface by the alveolar process and soft tissues.

Another point of marked importance is for our bands to fit properly. By this I mean bands with the least possible overhang at the gingival margin.

With these facts in mind, I feel that I have conclusively shown how invaluable the x-ray is in the examination of the case in hand, as well as the prime importance of x-rays during the treatment of cases as they are followed. I would not say that it is necessarily a routine which must be followed in all cases, but certainly the x-ray examination of the mouth at the time of making your study models is indispensable.

With this preparation, careful study of the case may be made. Following which the parents may be called to the office and the case thoroughly explained to them, as compared to normal, the method of treatment indicated, and financial arrangements made. It is also suitable at this stage to obtain photographs and other records necessary for future reference.

In the short time allotted me, I have endeavored to present some of the facts in orthodontia that every general practitioner should know, and I sincerely hope that my effort has not been in vain.

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HEREDITY AND ITS RELATION TO DENTISTRY*

By Clyde Keeler, B.S., M.S., M.A., D.D.S., Boston, Mass.

GENTLEMEN, I count it both a pleasure and an honor to address a few words to you upon this subject. During the minutes at my disposal I should like to draw your attention briefly to a few fundamental principles of inheritance and examples, completely divested of controversial minutiae such as beset the path of every science.

I. INTRODUCTORY

There is no phase of biology which is not in some fashion affected by heredity. This is a broad statement, but if we think for a moment we must all admit that it is true in a very real sense, since heredity in a great measure determines form and structure, and these jointly determine function.

In genetics and especially in eugenics we are accustomed to placing emphasis upon the transmission of kakogenic dissemblances from one generation to the next without realizing that all harmonious resemblances are as truly hereditary.

We glibly speak of the transmission of polydactyly, synactyly, radio-ulnar synosteosis, hemophilia, albinism, pigment dilutions, cancer, baldness, deafness, longevity, feeble mind, some four dozen eye defects and a myriad other anomalies. We say that they are inherited. The corresponding normal allelomorphic conditions are bequeathed as precisely.

If we extend our consideration to the lower animals, we see that the same laws of heredity reign over them as govern man's heritage. Many of the variations among these creatures are apparently identical with man's. If we regard the plant realm, we find no change in hereditary formulas. Genetic studies have been carried out upon flies, beetles, wasps, fish, amphibians, birds, mammals, corn, tobacco, jimson weed, four-o'clock, shepherd's purse, strawberries, peas and other forms ad infinitum. All obey the same rules.

In benign cultures of bacteria virulent strains may suddenly appear and propagate their kind through heredity. A tumor cell may abruptly change its form, color, or physiologic nature, and its progeny acquire the new peculiar behavior by inheritance. In like fashion with plants and animals, including man, new characteristics which arise without warning in the germplasm persist through hereditary transmission.

II. THE LAW OF HEREDITY

Let us consider briefly the mode of inheritance for such a common condition as albinism. This characteristic, we are led to believe, consists in the lack of power in cells to form the enzyme (perhaps tyrosinase) responsible for the oxidation of melanogen which normally produces melanin pigment in the pres-

*Read at a meeting of the New York Society of Orthodontists, Boston, Mass., Oct. 24, 1928.

ence of light. Pigment granules are formed in albinos but they are leucotic. That the chromogen is present is shown through the fact that it may be oxidized by other chemical reagents. This condition of albinism occurs in nearly all mammals and lower animals, while analogous cases are found in plants.

Let us consider specifically albinism of the house mouse as an example. Albino mice were known to the Greeks a number of centuries before Christ.*†

A study which I made upon mouse pelts in the British Museum leads me to state that albino house mice are caught in the wild from time to time in nearly every country in the world. Sometimes the hereditary factors for the production of albinism are carried latently in the wild gray stocks. At other times undoubtedly the germ plasm mutates anew to this condition.

White mice of the fancier have been selected for tameness but differ from wild mice in a single essential, that is, albinism. If appropriate crosses are made, the albinism may be removed and the gray coat of the wild mouse recovered.

But when an albino mouse is found, we may say at once that it is pure for albinism and that if mated to another albino, their offspring will be pure albinos forever.

If we mate an albino mouse to a gray mouse (Fig. 1), their immediate offspring will all be gray; yet, they will carry the albino factor latently. If these cross-bred grays then be mated together, they will produce offspring in the proportion of one pure-bred gray like the one grandparent, two cross-bred grays like the parents, and one pure-bred albino like the other grandparent.

If a cross-bred gray be mated to an albino (Fig. 2), they will produce cross-bred grays and pure-bred albinos in the ratio of one to one. This is the simple law of heredity discovered by Mendel, which is found by experiment to apply from peas to corn and from flies to man.§

*Aristotle mentions the *mus leukos* of Asia Minor in his zoological accounts. Aelianus, writing shortly after the time of Christ, describes the Temple of Apollo Smintheus on the Isle of Tenedos off the shore of Pontis where white mice were raised at public expense, being sacred to the patron god of this region. A coin struck at Tenedos 300 years B. C. shows the head of Alexander the Great on the obverse, while upon the reverse may be seen Apollo Smintheus and a sacred white mouse.

†Albino mice were used by the Chinese priests for auguries, and the government preserved accurate records of their taking in the wild for a period of several hundred years during the early Christian era. In Chinese history there are the following governmental records of the finding of white mice in China:

NUMBER OF RECORDS	DATE	PROVINCE
1	307 A.D.	Honan
1	411 to 516	Kiang-Su
1	411 to 516	Hu-Pe
4	411 to 516	Honan
1	411 to 516	Schi-Li
13	411 to 516	Schan-Si
2	758 to 799	Ngan-Hwei
Several white mice found at same time	1063 to 1641	Tsche-Kiang
1	1063 to 1641	Kansu
1	1063 to 1641	Schan-Si
1	1063 to 1641	Hu-Pe

§Iltis, 1924, Gregor Johann Mendel, Julius Springer, Berlin. page 68. "Wir haben schon gehört (von *Fr. Hornisch* und des Inspektors *Nowotny*, dass Mendel in einem seiner beiden Zimmer Mäuse züchtete, und zwar nicht nur weisse, sondern auch graue, und sie miteinander kreuzte. Es ist ganz leicht möglich, dass bei diesen mehr sphielerischen Versuchen die Erscheinungen der Dominanz und Spaltung ihm zum ersten Male aufgefallen sind. Er selbst erzählt zwar nichts davon. Das darf aber nicht wundernehmen, da ja schon die Beschaftigung mit den Naturwissenschaften einen Geistlichen in den Augen mancher Klerikalen Zeloten verdächtig machte, denen dann die Vornahme von Kreuzungen bei Tieren vollends unsittlich erschienen wäre.

Now let us suppose that a trait were dependent for its expression upon the presence of two recessive factors. Suppose that we cross such an animal bearing the trait with one bearing the normal condition. Simple mathematical calculations predict the return of the trait on the average, once in every sixteen in the second generation. If the trait depends upon three independent factors, the recovery will be about once in sixty-four. If dependent upon twenty independent factors, it will recur only once in a trillion, ten billion. In man, however, there are twenty-four of these possible groups of hereditary factors, and so it is highly probable that many of the complicated problems in human heredity which are insoluble today may in the future delight the neo-

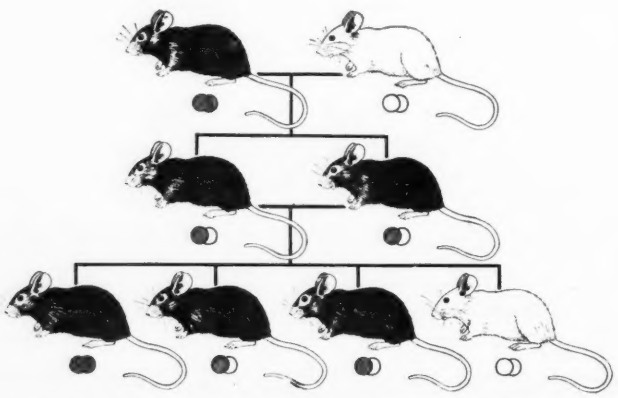


Fig. 1.—When a pure-bred gray is mated to an albino, all their immediate offspring will be gray; but if these gray children are mated among themselves, they will produce on the average ratios of one pure-bred gray: two cross-bred grays: one albino.

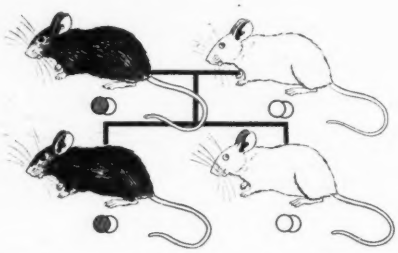


Fig. 2.—When a cross-bred gray mouse is mated to an albino, half their offspring are gray and half are albino.

pallia of more sapient men than we. We must be content with the simpler analyses and the applying of the rules discovered to more complicated cases.

For example, several years ago I crossed a mouse bearing the recessive hereditary characters, nonagouti, pink-eye, dilute, brown, piebald, and waltzing, with one containing short ears, kinky-tail and rodlessness. I mated their offspring together and obtained twenty-eight grandchildren.

Here we are dealing with ten different characters.* The mathematics are very complicated and to obtain complete relative quotas of all combinations possible in the second hybrid generation, we should have to raise several trillion mice.

*Later work has shown short ears and blue dilution to be linked. However, this would make little change in the present consideration where they have been regarded as independently segregating.

It turns out that for the few animals obtained
we expect 0 animals containing 0 recessive factor and find 0;
we expect 5 animals containing 1 recessive factor and find 8;
we expect 8 animals containing 2 recessive factors and find 9;
we expect 7 animals containing 3 recessive factors and find 7;
we expect 4 animals containing 4 recessive factors and find 2;
we expect 1 animal containing 5 recessive factors and find 2;
we expect 0 animals containing 6 recessive factors and find 0;
we expect 0 animals containing 7 recessive factors and find 0;
we expect 0 animals containing 8 recessive factors and find 0;
we expect 0 animals containing 9 recessive factors and find 0;
we expect 0 animals containing 10 recessive factors and find 0.

The above case is very complex in nature, and still we reap results highly consistent with the theory.

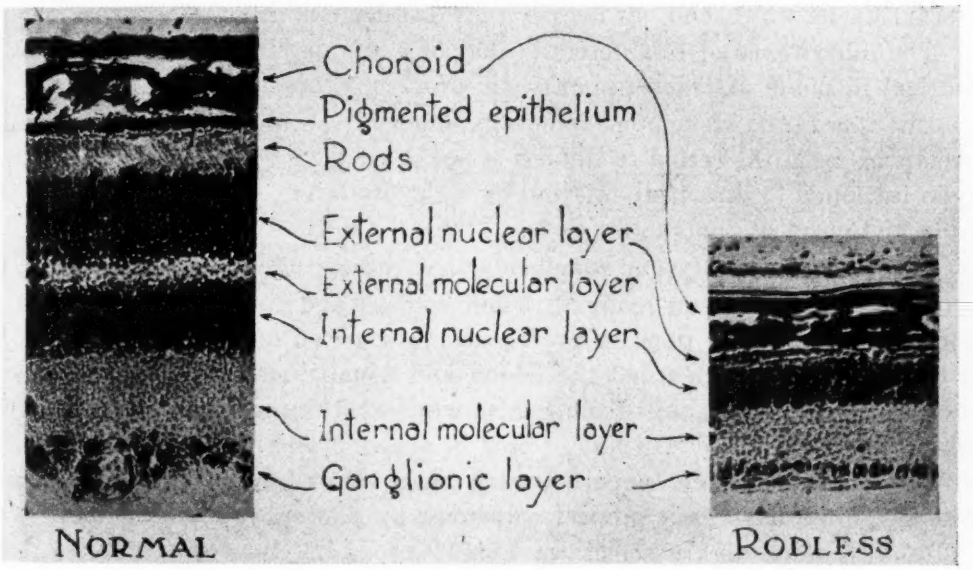


Fig. 3.—Photomicrographs of cross-sections of normal and rodless retinae showing their structural differences.

There is no rule by which we may predict from the observation of a trait how it will behave in heredity, and yet some arbitrary but not inflexible guides may be set down. Dilutions of pigment are usually recessive to normal; muscular and bone defects generally dominate over the normal condition. Cataracts and most eye defects are dominant, while a few are sex-linked recessives.

This means that orthodontists are concerned with defects which if hereditary are generally dominant and may be expected to reappear in about half the offspring of the patient, thus insuring a livelihood to the dental profession for generations to come.

It will be needless to go into the technical details of our evidence, both cytologic and genetic, for locating the hereditary factors within the chromosomes of all plant and animal cells, nor the eccentric behavior of the chromosomes in doling out these factors to the future organisms during the matura-

tion of the germ cells. We shall merely review here a few methods whereby the received hereditary potentiality reveals itself in ontogeny.

Let us take, for example, the case of rodless retina of the house mouse (Fig. 3), an ophthalmic anomaly which I have found in animals of laboratory stocks from Russia, Germany, and the United States.

At birth microscopic preparations of the retina reveal no striking differences between those individuals whose eyes are destined to differentiate normally and those which shall be rodless. If one counts numbers of cells and measures by means of an ocular micrometer widths of the several layers in retinae of embryos of seventeen days' gestation (twenty-one days being the total period), possible differences may be recorded. In the first few days following birth the rate of cell division and differentiation in the rodless eye lags more and more, so that when the eyes open upon the thirteenth day the external nuclear layer and rods are completely developed in the normal animal, whereas the rodless animal is able to develop only a few degenerate external nuclei which bud out neither rods distally nor neural fibers proximally.

The inheritance of this defect is that of a simple recessive unit character, identical in mode of transmission with albinism aforementioned.

But this faulty development entails much to the individual. The trigger mechanism from the retina to the iris is not developed, and although the latter organ responds to direct stimulation by light, its latent period between stimulation and onset of contraction is four times the normal duration.

Several tests justify our conclusion that rodless mice are totally blind.

Attempts have been made to teach rodless and normal control mice to choose an illuminated door in preference to a series of darkened doors. In all cases the controls learned the lesson and usually made the correct choice more than eight times out of ten trials; whereas, the rodless rarely found the lighted door.

Rodless mice do not wince or turn away when exposed to the brilliant light of ignited flash light powder as proved by photographic methods.

Rodless mice highly sensitized by injections of strychnine do not react visibly to the light of a projection lantern.

If the geotropic orientation of mice upon an inclined plane be measured in light and darkness, it is found that rodless mice behave the same in the light as they do in darkness; whereas, normal mice, which behave as rodless mice when in the dark, refuse to orient in the light.

By far the most interesting line of evidence has been obtained from the measurement of retinal action currents.

It has long been known that if leads are taken from the optic nerve and inside the retina respectively from the excised eye of a lower vertebrate having the cornea and lens removed, it will cause a characteristic series of changes in potential upon luminary stimulation. These electric responses may be recorded upon the revolving drum of an appropriate apparatus. The differences in potential constitute the electrical equivalent of the basic photochemical reaction causing stimulation of the sensory nerve endings and therefore serve as a test of whether or not the fundamental stimulatory reaction takes place.

If records are obtained for intact mice by taking leads from cornea and mouth respectively, since potential differences within the total system are measured, the normal potential differences are found. Rodless mice, however, exhibit no differences in potential, signifying that no basic photochemical reaction takes place.

As the rods are not developed, the visual purple which they normally secrete is absent. Since the visual purple is lacking, the normal photochemical reaction does not take place. Since there is no stimulation of nerve endings, no nervous impulse is set up. Since there is no nervous impulse to travel via optic nerve to the visual centers of the brain, there is no sensation of sight. A great chain of consequences follows upon the faulty and incomplete differentiation of a few microscopic cells of the external nuclear layer.

By way of parenthesis it may be stated that here we have the first definitely studied case of variation in numbers and development of nerve cells, studied from the genetic, histologic, physiologic and psychologic standpoints, which gives us a definite physical mechanism as a basis for our theories of the inheritance of capacity in man and other animals. Thus we see that neural cells may vary and these variations may be passed on through heredity, predetermining the limits and forms of neural function.

Many other things happen to cells. Hereditary color differences in flowers of the same species are often due to relative acidity of cell sap. Other cells normally dormant may be caused to proliferate. Sturgidity may be increased. Selective absorption may be impaired. Secretion may be interfered with, and any or all of these abnormal processes may figure in the ontogeny of a hereditary variation.

III. ENVIRONMENT

Heredity and environment* are inseparable in things biological. Organisms may not exist in the presence of one to the exclusion of the other, although their relative merits have long been controversial. All cells of the body have the same hereditary equipment, but the environment determines which shall become nerve, bone, or muscle.

We have seen how a whole group of consequences follows upon the development of the hereditary capacities received by mice with regard to the retina. In this case the environment has remained constant.

We know, however, that position with relation to the previously established central axis determines laterality. Position with relation to other axes determined later presages digital arrangement. A thumb never grows where a little finger should be. Incisors never replace molars.

Let us take an example of this moulding by means of internal environment. Some years ago I transplanted flank ectoderm, stained with Nile blue sulphate, to the gill region of Amblystoma punctatum, the common salamander (Fig. 4).

Under ordinary conditions the flank ectoderm would remain in a typically undifferentiated state. However, under the influence of position, these same stained cells grew out, multiplied and differentiated to become parts of the complicated brachial structure of this animal.

*Under "Environment" we here include all conditions outside of the cells in question, whether within the organism itself or without and wholly separate therefrom.

Flank ectoderm transplanted over the early optic cup, invaginates and delaminates to form a normal lens on the inside of the eye and a normal cornea on the outside.

Flank ectoderm placed at the dorsal lip of the blastopose of a very early embryo becomes moulded by that master sculptor, orientation, into neural plate and brain, a portion of which then evaginates to form the eye and other sense organs.

Thus lowly undifferentiated flank ectoderm carries in it an unthinkable multitude of potentialities if granted the proper environment.

If one cell of an animal body is defective in a particular germinal quality, every other cell in the same body is also defective in that same respect, since the defective gene in the fertilized egg from which it developed has divided at every cell division of the growing organism. Thus if we could transplant

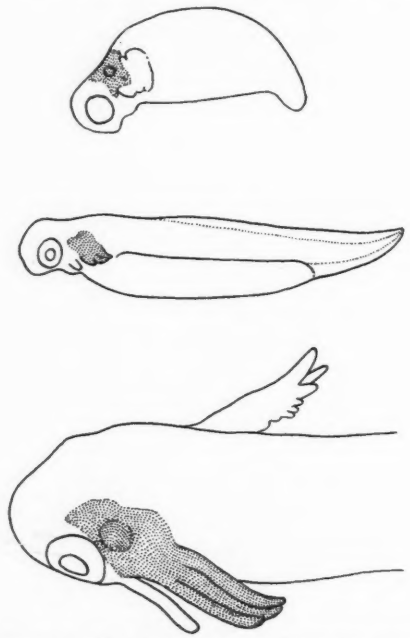


Fig. 4.—Three consecutive camera lucida drawings showing the development of gills from transplanted flank ectoderm in Amblystoma punctatum.

flank ectoderm of the rodless mouse to the neural plate, allow it to unfold to form brain and then outpocket again to form the retina, we should still expect it to form a rodless eye. If we could transplant to the jaw region of a human embryo carrying a definite hereditary factor for crooked teeth a piece of its flank ectoderm, that child would still be expected to develop crooked teeth from the transplanted tissue. We have left the environment constant, and since the hereditary capacity of cells from the flank are identical with those from the future jaw region, we should predict identical results. If a person has a faulty hereditary factor in one cell, he has it in all the cells of his body including the germ cell anlage and thus may transmit it to the future. Of course, I am not speaking of mutilations or injuries to cells. These are not transmittible.

IV. DENTAL ABNORMALITIES

And what shall I say of the heredity of human tooth anomalies? You, gentlemen, are better acquainted with this domain than I. It shall be my part

only to point out a few examples of my acquaintance and to ask your indulgence if you have heard them often before. Color of teeth is often hereditary, as are shape and size. Hardness of enamel runs in some families, almost total lack of it in others. Softness or hardness of pulp may be a family trait.

The absence of canines is often met with, and the lack of one incisor is known in our hereditary pedigrees. Failure to emerge in the case of wisdom teeth occurs so frequently that we seldom think of it as an abnormal condition.

Early loss of teeth is common to the spiny ant eater, while bats living upon a similar insect diet have fine dentitions. Certain people have lost all their teeth at twenty years of age. In regard to this last defect allow me to relate a bit of history.

In the latter part of the eighteenth century the seamen of the British merchant vessel "Bounty" mutinied in the South Pacific and set their officers afloat in an open boat. They took aboard some South Sea Islanders at Tahiti, and they escaped to Pitcairn Island where they proceeded to found a colony. A fight for possession of the colored women resulted in the death of the native men and left three whites who contested among themselves until Alexander Smith alone remained alive. Smith became the sole male progenitor of the colony for the next twenty years. A British vessel found the colony in 1815, and in 1839 the island was taken over by England as a dependency. The descendants numbered about a thousand in 1901, and there has been a substantial increase since.

The captain of the "Bounty" was rescued after floating 3600 miles in the open launch. He returned to England and swore out warrants for the arrest of the mutineers, giving descriptions of each in detail. Special mention is made of Alex Smith, who, though in his early twenties, had lost all his teeth.

Today his descendants, forming such a large population, lose their teeth very early and are the ridicule of the shiny toothed natives of the neighboring islands.

Crosses between Scotch and Japanese have been observed, and in the second generation numerous mental and structural disharmonies occur; the latter including small teeth in large jaws, and large teeth in small jaws.

No doubt you all have a question formulated in your mind something like this: From all this data can he not give us some practical hints of aid to our profession?

Gentlemen, I must answer this question in the negative.

Will not care and diet help preserve and keep our teeth straight? Yes. You know that better than I. You know the dire effect of syphilis, malnutrition and other environments. These you should endeavor to keep properly regulated through denticulture. Given that and a good inheritance, teeth may be straight and strong. Given the best environment possible, a bad inheritance will bring shame to every generation. To insure good teeth to our children we must marry individuals with ideal teeth, yet no one would ever suggest this as a salient criterion for mate selection, since so many other hereditary characteristics are much more important, and you have built up an art and a science so precise that you can teach us to regulate the environs of our teeth for all generations and can repair the hereditary faults of each generation as they arise.

AMERICAN SOCIETY OF ORTHODONTISTS

TWENTY-SEVENTH ANNUAL MEETING
APRIL 30, MAY 1 AND 2, 1928

Report of Round Table Luncheon and Discussion

Chairman.—L. M. Waugh, New York City.

Outline:

(A) Each Topic Leader had chosen twelve members to sit in conference with him.

(B) He had prepared a concise list of questions for those of his table, requesting that they come to the luncheon prepared to express an opinion on the questionnaire which he had mailed them. Those unable to attend were requested to send answers by mail in which case they were counted present.

(C) Discussion took place during luncheon, and the answers to the questionnaires were tabulated. Every member at the meeting was requested to attend, as there were additional tables with Topic Leaders for those not previously chosen.

After the luncheon each Topic Leader was called upon to read his summary of answers.

Table No. 1.—Topic: In what way may mouth cleanliness most effectively be maintained during orthodontic treatment?

Topic Leader.—Percy R. Ashplant, Newburgh, New York.

To this end:

(a) Do you, or your hygienist, clean the patient's teeth during treatment? If so, why?

(b) Do you refer the patient to his own dentist for this work? If so, why?

CONCLUSIONS

In summing up the two questions which involve the care of mouth hygiene of the patient during orthodontic treatment, this should be discussed and definitely settled with the patient, before starting treatment, to determine upon whom to place the responsibility.

The dentist usually prefers to take charge of this work. This, however, may be imperfectly done, in which event we feel the orthodontist should give it his attention, in addition to whatever routine procedure of cleansing he may be following at each appointment.

We arrive at these conclusions as experience has taught us that decay occuring during treatment may be blamed upon our appliances by the dentist as well as by the patient.

Table No. 2.—Topic: (a) How frequently should apparently well-cemented anchor bands be recemented? (b) How frequently the other bands?

Topic Leader.—James C. Allan, New York City.

(a) All favored the recementation of well-cemented molar bands in from nine to twelve months in an average case. In cases which showed a tendency to decalcification of the enamel, the judgment of each individual operator would have to be resorted to.

(b) Seven men favored six months. Five men favored nine to twelve months. All favored six months in case of undue stress from deep overbites or other causes.

(c) No faith should be placed in the therapeutic value of cements for the protection of enamel under orthodontic bands.

(d) Rigidity has a definite bearing on the length of time that bands may be left on safely.

Table No. 3.—Topic: In what way should the orthodontist cooperate with the general practitioner in keeping a "check-up" on new cavities and abnormal gingival conditions?

Topic Leader.—Carlton B. Mott, Asheville, North Carolina.

No. 1.—Do you insist that all work of a general nature necessary in each case be properly attended to before you start treatment? Eleven answered yes; 1 answered no. This is the opportune time for the orthodontist to get in close touch with the dentist. A visit to his office will show your appreciation, and a frank consultation will prevent future troubles. The next best method is by phone.

No. 2.—How often do you examine your patients for cavities and abnormal gingival conditions? Three said each visit; 1 said each month; 8 said every three months. We recommend having printed on appointment cards to visit their dentist every four months.

No. 3.—How often and in what manner, if at all, do you consult with the general practitioner concerning the conditions present? Twelve answered, when necessary.

No. 4.—What is the responsibility of the general practitioner in maintaining a healthy mouth condition? Nine said divided responsibility; 3 answered that entire responsibility rests on the orthodontist.

No. 5.—What is your procedure in those cases where the general practitioner who referred the case fails to do efficient work? All agree that the welfare of the patient comes first. Diplomatic handling will often solve this problem; each case is a law unto itself.

When the dentist fails to cooperate with the orthodontist and the patient will be injured by his neglect or inferior work, it is the orthodontist's duty to so inform the patient and parents; and if they fail or refuse to have a competent dentist care for the patient, then the orthodontist should refuse to start the case or continue treatment.

Table No. 4.—Topic: How do you meet the problem of the undernourished patient?

Topic Leader.—F. A. Delabarre, Boston, Massachusetts.

It was the unanimous opinion that undernourishment affected the prognosis unfavorably and rendered the rate of progress much slower.

The factors responsible for the undernourishment, aside from diet, which should be considered were all health habits, both physical and mental, and in addition heredity, environment and physical defects.

It was considered desirable to enlist medical cooperation, preferably the pediatrician, because his attitude toward his work is that of maintainance of health instead of cure of diseases. The general medical practitioner is not apt to be interested unless there is direct evidence of pathology.

All were agreed that the height-weight index should be included in the examination and continued during the conduct of the case, since it is a fairly dependable indication of the physical status of the patient. It should be taken at stated intervals to check up on the physical growth and development and as an indication of the amount of physical or mental strain occasioned by the treatment.

It is, therefore, recommended that this item be added to the diagnostic chart and treatment records.

Table No. 5.—Topic: When the permanent first molar is lost, do you as a principle: (a) Maintain the space for an artificial substitute? (b) Close the space? (c) Why?

Topic Leader.—Max E. Ernst, St. Paul, Minnesota.

There were twelve men present at this table. Ten replies to the questionnaire were received through the mail, the persons answering not being able to be present at this table. Some of the replies received were general in character and could not be used in tabulating the results. This report will include the opinions of the men present as well as the opinions received through the mail.

There are many factors which may be present, in cases of malocclusion, where first molars are lost, which must be considered in diagnosing and analyzing cases of this type. Some of these factors are: type of malocclusion, time at which first permanent molars were lost, age of patient, facial balance, condition of adjacent and opposing teeth. These factors and many others must be considered in arriving at an intelligent diagnosis. The skill and judgment (or the lack of these two requisites) on the part of the general practitioner, who

would supply the artificial substitute, may be the deciding factor in some cases in arriving at a decision whether to close a space or to maintain it for an artificial substitute.

Realizing that there may be conditions present in any individual case of this type which would be deciding factors in diagnosis and treatment and realizing also that in the short period of time at our disposal it would be impossible to discuss these questions from the standpoint of these factors, it was decided that we confine the discussion to cases where the first molar was lost after eruption of the second molar and when the age of the patient was not more than thirteen years.

The general question was discussed under following conditions:

1. Maxillary molar lost in case of neutroclusion: 11 would close the space if possible; 4 would maintain space.

2. Mandibular molar lost in case of neutroclusion: 13 would close space if possible; 3 would maintain space.

3. Maxillary molar in case of distoclusion: 16 would close the space if possible.

4. Mandibular molar in case of distoclusion: 10 would maintain the space; 6 would close space if possible.

5. Maxillary molar lost in case of mesioclusion: 17 would maintain space.

6. Mandibular molar lost in case of mesioclusion: 17 would close the space if possible.

The reasons for the answers given varied with the different men. Of those who would close the space of the lost molar, the majority would do so to eliminate the mutilation of teeth necessary in order that artificial substitutes may be placed. It was the opinion of these men that a mouth with a good occlusion, obtained by closing the spaces, was to be preferred to a so-called normal occlusion, which must be obtained by inserting an artificial substitute at quite an early age. The permanence (or lack of it) of such a restoration must always be considered. Ability to maintain oral prophylaxis where no artificial substitute is present was also given as a reason to close the space if possible.

Reasons given for maintaining the space, in general, were: the difficulty and uncertainty of moving second permanent molars bodily into the position of the first molar, also the fact that the second molar was not really a good substitute for the first molar.

In questions 4 and 5 another reason for maintaining space was that the respective arches were, in most cases, posterior to their normal positions and in many cases not sufficiently developed, and it was not thought wise to lessen an already undeveloped arch.

In questions 3 and 6, the arches were in many cases anterior to their normal positions and the closing of the space would be the proper treatment.

7. Would your treatment vary if third molar were absent? Practically all the men who advised the closing of the space, where possible, would vary the treatment if the third molar were absent. The reason given was that there would not be enough masticating surface with only one molar present on either side of the arch.

8. Would your treatment vary if more than one molar were absent? The men were largely of the opinion that if opposing molars were absent, as a general rule, the spaces should be closed. With three first molars missing, many of the men advised the extraction of the remaining molar, and closing all the spaces.

9. Would your treatment vary depending on the age of patient? The opinion was very general that the closing of such spaces became more unfavorable and presented more difficulties as age of patient increased. While it was difficult to state an arbitrary age after which it would not be desirable to attempt closing of such spaces, the opinion prevailed that after fifteen years of age the spaces should generally be maintained.

Table No. 6.—Topic: Under what conditions do you: (a) Close the space of one or more missing laterals? (b) Open the space of one or more missing laterals?

Topic Leader.—William C. Keller, New York City.

In this paper neither the individual case nor the ideas of the individual orthodontist are considered. In answering questions of this nature one must consider not the abstract but the general trend of opinion. As each case presents a different problem, so must each

operator use his ingenuity. It is hoped that in giving the ideas of the majority some knowledge may be gleaned that will be helpful to all.

At this time I wish to thank all members of the round table for their help, and also to thank the many who were kind enough to send replies to the questionnaire that was mailed them.

Below are the questions that were presented for discussion:

1. Is it advisable to extract a well-rooted deciduous lateral when the permanent successor is missing?

1-A. Would you advise the same for one whose root has been resorbed about half?

2. Under what conditions would you close the spaces of one or more missing laterals?

3. Under what conditions would you open the spaces of one or more missing laterals?

4. Would you advise artificial restoration if a fairly good result could be had by closing the spaces?

The questions are not altogether easy ones to deal with, for one cannot give any set rule that will govern all cases. In cases of this type the individuals must be considered, and a study based on them and all other conditions in the mouth must be borne in mind when making a diagnosis. It is also advisable in every case that the wishes of the child and of the parent be considered. They must fully appreciate the conditions which will prevail in their case some years hence. In congenital conditions the problem involved is often one which has been up for discussion in previous years when the parents of your present case suffered a similar condition. Invariably the mother thinks that her beauty would have been enhanced and her health improved had her case been treated in the reverse. Namely: spaces that were closed should have been opened, and those opened should have been closed.

In the answering of the questions it must be remembered that the rule of the majority must be followed.

No. 1. Although the future of a well-rooted deciduous lateral is not too well assured, it is not advisable to extract it. The dimensions of the deciduous lateral create a severe disharmony in both effect and appearance and can often be overcome by the porcelain jacket crown. Because it is very difficult to know just when the root of this tooth is going to absorb and cause later trouble, this cannot be conscientiously advised.

In the second half of the first question it is advised that the lateral be extracted. It is evident that when a root is partially absorbed the absorption is due to the action of the cementoclasts and the cementoblasts. With this condition present the root will soon be absorbed, and the sooner provisions are made for a permanent arrangement of the mouth without the tooth, the better the conditions.

Questions 1 and 2 are so closely related that it is believed that they can be answered as one.

The question of whether to open or close the spaces of the missing lateral is a colossal one, and many conditions must govern your decision. It is really a question of the individual. The facial lines are to be considered, the general condition of the remaining teeth, the age of the patient, and the degree of deformity.

The problem in the maxillary arch is chiefly one of appearance, while in the mandibular arch it becomes a matter of function; it is a very serious question which must be considered. In both cases a disharmony, a very unpleasant one, has to exist.

In the maxillary arch, if all the teeth from the canines posteriorly are in perfect occlusion, one would hesitate to drift them forward to close the spaces; otherwise in the young it would be considered feasible to close the spaces by a forward movement of the posterior teeth. This compromise for Nature's loss is better than to supply the missing teeth artificially and suffer usual consequences.

The intelligent application of the stone to the canine to perfect contour, occlusal relations, etc., would lead to the expectancy of a reasonably artistic result and would warrant the closing of the spaces. The exceptions are cases of deep overbite and cases where insufficient number of teeth or lack of development will give the "fallen-in" appearance.

In the mandibular arch, closing of spaces leads to a deep overbite, bad occlusion and ultimate liability of trauma as its price. The opening means the problem, an infernal one,

of restoring the mandibular incisors artificially, but the general functional relations are more properly cared for.

It must be remembered that appearance is not the only thing to be considered. The bone development of the face must be kept in mind. Thought must be given to the development of the bones of the nose and to the developing sinus. The appearance of the teeth must always give way to the health and development of surrounding structures.

No. 4. If a fairly good result could be had by closing up the spaces and there were no objections from esthetic reasons, artificial restorations are not advised. It is to be remembered that you are treating the young, and it is never advisable to inflict abnormal conditions at such an early period.

Table No. 7.—Topic: (a) To what extent do you attempt to correct excessive overbite? (b) Describe your means of treatment. (c) What retention is used?

Topic Leader.—Harry C. Metz, Pittsburgh, Pennsylvania.

An attempt to discuss the topic as outlined in the program brought forth such diversified opinions that it was decided to substitute several questions having a bearing on the topic that the answers could more readily be tabulated. Seventeen men took part in the discussion.

First, in answer to the question, Do you attempt to correct excessive overbite cases? All answered in the affirmative.

Second, what are your means of determining the necessity of this treatment? The majority were guided by the facial disharmonies and loss of occlusal balance.

Third, in trying to determine at what age it was found advisable to start treatment, it was decided that the complications associated with overbite determine the time to start. An example being, if associated with distoclusion start treatment early.

Fourth, when an attempt was made to classify the methods of treatment, we found it quite difficult to find a majority in favor of any particular method, thirteen of the seventeen men favored the use of a bite plane. Seven preferred a metal bite plane or crib attached to a removable lingual arch. Four used the vulcanite bite plane, and two used the metal extensions soldered to the lingual of the maxillary anterior teeth, the teeth in turn being supported with a ribbon arch.

Fifth, the possibilities of holding such a correction depend upon the age of the patient and the time consumed in the treatment rather than upon the method of treatment.

Sixth, what retention is used? The majority use no special retaining appliance but continue the use of the appliance used during treatment of the case for the reason that this is more convenient and accurate than some specially constructed retaining appliance.

Table No. 8.—Topic: Have you ever found it impossible to cause an unerupted tooth to erupt by mechanical means? (a) Deciduous. (b) Permanent. If so, to what do you attribute the cause?

Topic Leader.—Albert W. Crosby, New Haven, Connecticut.

In reply to the question, Have you ever found it impossible to cause an unerupted tooth to erupt by mechanical means, the answer has almost unanimously been, yes for some deciduous teeth, notably deciduous molars.

The reply in the case of permanent teeth has been about evenly divided. Those who say no have usually expressed themselves as having had great difficulty in persuading some individual teeth to erupt. Dr. Ketcham wrote me that he had had three cases in which all the teeth in the same arch were depressed without the tooth yielding and in which he finally enlisted the teeth of the other arch. Dr. Young wrote, "I have never failed to move a permanent tooth. I have failed in moving a deciduous tooth." Dr. Grieve says, "I have had several cases where there were one or two teeth that would not erupt under orthodontic persuasion. I find I cannot move them at all." He cites one case in which all deciduous molars were affected in this way. "The first permanent molars erupted to occlusion, and when these latter teeth were in contact, you could put your finger between the upper and lower deciduous molars on both sides." Dr. A. LeRoy Johnson says, "In two cases of permanent canines the apices were bent at right angles to the long axis of the tooth and were imbedded in compact bone. In the case of the maxillary canine the apex was in the

wall of the antrum, and in the mandibular canine it was in the lower border of the mandible in the compact tissues. In both cases I had x-ray pictures showing the bend in the root.'' He made a plea for radiographs which show the apical end of the root clearly.

Answers to the question, Will the radiograph show the condition? developed the fact that there are some radiographs which will show why a tooth or teeth will not erupt and some that will not.

What is the character of the bone in which they stand?

Cases similar to those cited by Dr. Grieve in which deciduous molars and later premolars cannot be forced to erupt seldom, if ever, show the reason in the radiograph; but in cases like those cited by Dr. Johnson and others which have been discussed at the table there is an obvious reason why some teeth cannot be moved unless surgical means be resorted to. For example, it would be folly to try to move an impacted canine if the compact bone around the crown is not removed. Here the reason is obvious. The compact layer is lacking in haversian systems and is therefore difficult, if not impossible, to absorb by pressure. Ivory-like spots in bone known to the medical profession as eburnations, which may result from a low grade osteomyelitis and is the effort of nature to wall off an infection, sometimes form a barrier. Bone whorl, quoting from Raper, is ''a particularly dense area occurring in bone.'' It may be caused by prolonged mild irritation like that produced by an impacted tooth. It is sometimes responsible for facial neuralgia. Dr. Cryer said he had found it necessary to open bone and remove the whorl. Quoting from a recent letter from Dr. Raper to Dr. Murlless, ''I do not know what causes bone whorls any more than I know what causes moles; they are idiopathic. There are osteosclerotic spots in bone which are also nonpathogenic and occur idiopathically. About the only difference between bone whorl and what I have termed osteosclerotic spots is that bone whorls are smaller, denser and more inclined to be circular in outline. There is still another condition which I have found in a case of partial ankylosis which shows in the radiograph and which has a history of rickets. Where there is an ankylosis which cannot be broken up, it is obviously impossible to move the tooth or teeth affected.''

What other questions come to your mind in thinking of the subject? This raised a debate as to ways of improving the metabolism. The effect of environment, diet, use of cod liver oil and the ways of stimulating the endocrine ring were discussed. We already know that hypothyroid conditions are attended by tardy eruption of teeth; on the other hand, it is difficult to put the blame on the endocrines when a small area only is affected.

Dr. Engstrom brought out an important fact when he gave Anthony's definition of the word erupt. ''Erupt: (a) to break through (b) as applied to part or all of the incisal edge or occlusal surface of a tooth, to move through the mucous membrane of the gum. Post eruption: movement of the tooth subsequent to eruption.'' In answering the questions post eruption is what has usually been meant.

It is impossible to tell in these answers a number of interesting things which have come out in the discussion without consuming too much time.

Table No. 9.—Topic: (a) What is the earliest age at which the mandibular third molar has shown radiographically? (b) The latest age?

Topic Leader.—Paul G. Spencer, Waco, Texas.

A questionnaire was sent to some thirty or more members and also to several leading radiodontists. Twelve members entered into the discussion at lunch. In the limited time we were only able to take up one or two additional questions. However, from the replies to the questionnaires the following summary is given:

The earliest age at which the mandibular third molar has been shown radiographically was reported as seven years, with nine to ten years the most frequent ages. The latest age was reported as between thirteen and fourteen years.

To the question, In what percentage, generally speaking, are you able to retain the mandibular third molar in treated cases? the replies varied between 5 per cent to 80 per cent. Those giving the lower percentages were making observations some four to six years after treatment.

To the inquiry of early removal, if removal is deemed necessary at some time, the majority of replies favored the procedure of Dr. C. O. Simpson that "to prevent complications they should be removed before roots develop."

As to technic and different angles necessary to radiograph properly, the majority advocated necessity of both intra- and extraoral radiograms, at least two extraoral—one laterally and one vertically with the long axis of the tooth.

Dr. H. R. Raper observed that the occlusal surface of the mandibular third molar is usually tipped forward.

If a careful examination is made of our models in conjunction with proper radiographs, we will find in a majority of our cases (which include all types of malocclusion) that the mandibular third molar is lying buccally-distal to the second molar and, depending on age, is forcing the second molar lingually.

To the query, When and in what types of malocclusions is the mandibular third molar a hindrance in treatment, the answers were as varied as the number of replies received.

From this tabulation it is evident that no definite policy or plan of procedure is given to our third molar problem, except theoretically, or when necessity of a decision is forced upon us.

Apparently the cycle of the third molar falls in a period outside our responsibility. A study of our relapsed cases will probably change this attitude. The study of the evolution of the third molar, both mandibular and maxillary, through all types of malocclusions and in different races, all the while keeping in mind the small percentage of people (regardless of orthodontic treatment) who are free from impactions or partial eruption complications, will, I am sure, aid us materially in solving some of our orthodontic problems. Each individual is a study within himself. When we cease to make proper use of anything, Nature starts the process of elimination.

Table No. 10.—Topic: What financial arrangement do you prefer: (a) A predetermined fee for completed treatment? If so, when are payments required? (b) An initial payment for preliminary work and the making and placing of the appliances, and a yearly fee determined by the amount of treatment needed? (c) If method (b) is used, do you name a maximum which shall not be exceeded for the completed treatment?

Topic Leader.—Claude R. Wood, Knoxville, Tennessee.

This is a phase of orthodontia that has not received so very much attention in orthodontic literature. While its place is not due to be in the front rank, yet it is a necessity and very important from many standpoints. It plays an important part in the life of every orthodontist, and it is from the orthodontist that orthodontia will progress. He must have leisure hours in which to devote to study and go into the unknown fields. If he is not hampered by financial worries, he may spend his leisure hours in study and research.

It is to this end that a questionnaire was prepared on this subject and sent to thirty practitioners.

1. Do you use a predetermined fee for completed treatment? If so, when are payments required? Twelve answered yes. (a) Deposit when appliances are placed, balance in monthly, quarterly or semi-annual payments during an approximate time. (b) One-third when case is started and one-third when half completed, balance when retainers placed.

2. Do you have an initial payment when the work is started and the appliances placed? Twenty-eight said yes, definite; two said usually. (a) If you use No. 2, how are payments made for the remainder of the case? Monthly, quarterly and semi-annually, majority preferred quarterly but depending upon ability of patient. (b) If you use No. 2, do you quote a maximum fee for the completed case? Ten said yes; twenty said no.

3. Do you have cases contracted for a certain fee for each year's work? Seventeen answered yes; thirteen answered no. (a) Do you quote a definite time for these cases of No. 3? Seventeen answered no, only approximate. (b) How is the fee collected on No. 3 cases? Monthly, quarterly or semi-annually.

4. How do you charge for cases of physicians' children? The answers on this question varied from full fee for some, a 20 per cent discount, a one-fourth discount, a one-half discount or free cases.

5. How do you charge for cases of dentists' children? The same answer for physicians can apply to dentists?

6. What method do you prefer for transfer patients from other orthodontists in regard to fees? For the new orthodontist to make his own charge seemed to be the general opinion, after having communicated with the former orthodontist.

CONCLUSION

From the consensus of opinion as expressed from the questionnaire the financial arrangement that most practitioners seemed to prefer was the yearly basis plan for orthodontic cases with giving approximate time for completed cases but no definite time when the case will be finished.

Several seemed to prefer the plan of a definite fee for all cases.

The majority required an initial payment when appliances are placed and monthly, quarterly or semi-annual payments thereafter.

Rather much interest was manifested in the question of transfer patients. No definite conclusion could be reached on this question, but most were of the opinion that it was better for the new orthodontist to make his own financial arrangement with his patient.

Enough was brought to light that I believe a paper on this subject at a future meeting would be of great interest to all members.

Table No. 11.—Topic: Do you make an extra charge: (a) For occasional unforeseen visits out of the office as in cases of illness, etc.? (b) For renewal of lost or broken appliances that cannot be repaired? (c) When patients need service as on vacations, etc., from another practitioner, do you require them to pay the practitioner direct, or do you have the statement sent to you? (d) For any other service such as radiograms, photographs—or does your fee include all?

Topic Leader.—Harle L. Parks, Atlanta, Ga.

1. (a) Do you make a charge for an examination consisting of looking at patient?

Six made charges for looking at patient. Thirteen do not.

(b) Do you make a charge for a diagnosis consisting of history, x-rays, photographs, etc.?

Eighteen make charges for diagnosis. One does not. Unwritten discussion, consensus of opinion is that a charge should be made for all types of diagnosis to all prospects who are typical shoppers. Their only object is beating price and not service.

2. Do you make an extra charge for occasional unforeseen visits out of the office as in case of illness?

The consensus of opinion is that a charge should not be made. One at the table makes a charge, eighteen do not.

3. (a) Do you make an extra charge for lost appliances? (b) Do you make an extra charge for broken appliances that cannot be repaired?

The consensus of opinion is that all lost appliances and retainers should be charged for. In the case of broken appliances we should use discretion not making extra charges where it will be detrimental to the individual orthodontist.

4. Do you make an extra charge for frequent broken appointments?

Seven make charges using discretion and find that it has a tendency to refresh the mental condition of these particular patients as one or two charges have been sufficient to stimulate the patients to where they can always remember their appointments. Twelve do not charge.

5. (a) When your patients are on vacations and need service, do you require them to pay the practitioner or do you require the practitioner to send you the statement for his services?

(b) In the event of vacations, who should be the loser, the orthodontist who starts the case, the orthodontist in the vicinity where the patient is spending the vacation, or the one who has plenty of money to take the vacation?

Eighteen are of the opinion that the patient should take care of any additional charges made during the vacation. One is of the opinion that he should pay the practitioner who renders service to his patients while they are on vacations.

6. Do you make an extra charge for radiograms, photographs, etc., or do you include these in fee?

Three make charges for all x-rays and other records regardless whether the case is started or not. Sixteen do not make charges provided the case is started. The consensus of opinion is that a charge should be made for the majority of cases if the treatment is not begun.

7. Do you make an extra charge for referring your patients to another orthodontist when you send all records, and select the best orthodontist for this particular individual case in that territory?

Nineteen do not charge for referring patients.

SUMMARY OF DISCUSSION—OSCAR E. BUSBY, DALLAS, TEXAS

Study the ability and willingness of your patient to pay you a fee and try to charge your fee reasonably; in other words, there is a class of people who have nothing but money, there is a second class who have some money, some culture and appreciation of what we are trying to do, and a third class who have very little money but much appreciation. So charge first class a big fee, second class medium fee, and third class minimum fee; in other words, do easy work easy, and hard work hard, just like playing pocket pool—make easy shots easy and hard shots hard.

Table No. 12.—Topic: Concerning oral prophylaxis during orthodontic treatment.

Topic Leader.—Frederick T. Murlless, Jr., Hartford, Connecticut.

Question 1.—What arrangement between the patient, the dentist and the orthodontist do you consider the ideal one for the supervision of the cleanliness of the patient's mouth?

Although it seems difficult to find an ideal arrangement, it is almost the unanimous opinion that supervision of procedure intended to control oral conditions should be primarily with the orthodontist.

The employment of a hygienist by the orthodontist seems most desirable because it is difficult to refer the patient to the family dentist's hygienist to secure thorough oral cleanliness while the removable portions of appliances remain in the mouth.

Inspection for defects and for caries should be a constant care and always associated with prophylactic procedure.

The hygienist should be required to report all suspicious places at once, and copies of a record chart with marked places mailed to the dentist, with a formal request to consider these and examine further.

Question 2.—To what extent does the hygienist in your office polish the patient's teeth at each appointment?

Seventeen out of twenty-six orthodontists do not employ hygienists.

One suggests that "Too frequent attention by the hygienist breeds home neglect." Another says, "I am not encumbered with a hygienist," and to quote another, "We plan to have each patient wearing appliances have a full prophylaxis with orange wood stick and pumice every six or eight weeks. If the patient wears a labial arch, teeth would be gone over with brush in porte-polisher, the arch polished and tubes sprayed out every two or three weeks." This man employs a hygienist. Another says, "Separable parts of the appliance are removed and sterilized at each visit and while the appliance is out of the mouth the teeth are polished by the hygienist with wood point and powder."

Question 3.—To what extent do you oversee the hygienist's work?

Of those who have hygienists one says, "very little," and one checks up each time. Two, while differing in methods, make systematic effort by means of records to secure frequent routine prophylaxis.

Question 4.—How do you deal with the patient whose mouth is habitually filthy, but who says, "But, Doctor, I brush my teeth twice a day"?

Several suggest an appeal to parents either personally or by letter. All alike say to instruct, and afterward if condition does not improve a majority of the men would withdraw from that particular case. Whether this is a record of experience in all cases, or expression of a strong inclination, your chairman does not feel warranted in concluding.

Dr. Crosby says, "Inquire into diet. Percy Howe says that a diet with an abundance of milk, green vegetables and fruit insures a healthy mouth and a minimum of caries. Patient is probably eating too much carbohydrate food."

In all answers to this question there is a suggestion of pessimism and acknowledged futility. A number suggest having the patient bring toothbrush for instruction, and another suggests recourse to prayer. One says, "Problem unsolved."

Question 5.—Should patients whose mouths are not kept habitually clean be required to keep more frequent appointments?

"Yes," is the answer of ten; "Get rid of them," is the answer of one; "No benefit from my observation," is the answer of another.

It is also suggested that the inconvenience of repeated extra visits for prophylaxis solely might in time react favorably upon oral conditions. One man in writing me says, "Yes, for two reasons: to teach importance and value of oral cleanliness, as well as to restore health in the mouth."

Question 6.—Should an extra charge be made for all prophylaxis? For extra prophylaxis? Should an estimate of this be given at the time the case is undertaken?

To the first question of this group several answered "Yes" without qualification, and several said or clearly implied that prophylaxis is not a part of the orthodontic treatment and should constitute a separate item for which a set and prearranged fee should be charged. One says, "Make no charge, take no responsibility."

One "considers it a part of treatment," and two reply "that the estimate covers all."

To the second question, one of these last two says he doesn't believe in "extras."

Three others feel that the yearly fee should include ordinary prophylaxis with the understanding at the time the financial arrangement is made that an extra charge will be made for extra prophylaxis made necessary by the patient's neglect.

To the third question there is a considerable divergence of opinion. Two say "Yes" without comment, and several imply an affirmative opinion, or say that the fee for prophylaxis should be included in the arrangement. While one says, "No, the fee should not be included in the orthodontic fee." One other says, "A charge for each visit would be better. The increased outlay might induce greater care on the part of the patient." Another says, "If undertaken as a part of case, there should be an understanding about a fee for this work."

Another writes quite fully, "It is our policy when starting a new case, to have a definite understanding with the patient as to just what responsibility and what work in the mouth we are responsible for and a definite understanding of the work we undertake. If the orthodontist has undertaken the prophylaxis, he should have a definite financial understanding with the patient for this work."

SUMMARY

Discussion of this subject as a whole makes it apparent that in undertaking the treatment of a case in orthodontia, notwithstanding all preliminary disclaimers and arguments, the orthodontist, by implication and to the minds of all concerned assumes the entire responsibility for oral conditions during the period of treatment. Whatever cooperation may be secured from patient, parent or family dentist is apt to be regarded by each as a concession from them and to be accepted by the orthodontist without recourse, except so far as diplomacy, persuasion and threats may have served to establish a different relation.

All these other parties to this relation are somewhat prone to seek to evade responsibility for neglect or oversight, and to regard the orthodontist as having assumed responsibility not only for producing the desired orthodontic result but also with reference to the control of all adverse conditions which may intervene. Hence it is necessary for

self-protection as well as for the obvious advantage to the patient that the orthodontist, with the assistance of the hygienist where possible, should oversee and direct the patient's personal attention to the matter of oral cleanliness. He should require the cooperation of the parents and make every effort to secure the sympathetic interest of the family dentist as well as of the patient. Where the family dentist or his office is depended upon for oversight of conditions pertaining to oral cleanliness and detection of defects and cavities in the mouth of the patient, a check and record of these visits should be kept by the orthodontist. Otherwise routine prophylaxis and inspection for cavities at frequent intervals is incumbent upon the orthodontist.

Logically, the compulsory service involved in meeting this implied responsibility in regard to oral health deserves remuneration. Whether a part of the fee should be definitely apportioned to prophylaxis and general oral supervision seems to depend upon individual choice, and also upon the fact that very many orthodontists do not employ the services of a hygienist.

Tables No. 13 and 14.—Topic: Orthodontic Education.

Topic Leaders.—O. W. White, Detroit, Mich., and L. M. Waugh, New York City.

This topic and questionnaire were prepared to provide for those who could not be accommodated at the other tables. Thirty-two members and guests took part in the discussions.

SUMMARY

1. In the undergraduate dental course can sufficient training be given to prepare the student adequately for:
   (a) Specialization upon graduation?
   No, answered by 26; yes, answered by 3; yes, with proper instruction, answered by 3.
   (b) Safe treatment of orthodontic cases in connection with general practice?
   No, answered by 18; yes, answered by 7; yes, but in simple cases only, answered by 7.
2. (a) Should every undergraduate be required to treat patients?
   No, answered by 31; yes, answered by 1.
   (b) Should he be allowed to treat patients as an elective?
   Yes, answered by 3; yes, under direct supervision, answered by 20; no, answered by 9.
   (c) Give reasons for your answer.
   Present conditions in dental schools, answered by 12; depends on students' interest, ability and time, answered by 20.
3. (a) Can orthodontic treatment be safely given in a clinic that is open only during the academic year?
   No, answered by 26; yes, answered by 6.
   (b) Why? No, answered because continuous service must be available.
4. (a) Should the didactic course include more than the principles of orthodontia: recognition of the factors which predispose to malocclusion and the development of judgment as to when treatment is indicated?
   No, answered by 8; yes, answered by 24.
   (b) Should the technic work include more than free-hand soldering and the development of an ability to repair appliances intelligently and make minor adjustments in emergency calls?
   No, answered by 27; yes, answered by 5.
5. For proper preparation for specialization is training after graduation imperative?
   Yes, answered by 29; unanswered by 3.

Case Reports

PROGRESS REPORT OF THE CORRECTION OF AN EXTREME CASE OF DISTOCLUSION, UTILIZING OCCIPITAL ANCHORAGE, THE PIN APPLIANCE AND BUCCAL PLANES*

By George W. Grieve, D.D.S., Toronto, Canada

THIS case is not being reported with the idea of showing any particular accomplishment in treatment, but to demonstrate the futility of endeavoring to correct a distoclusion case of this magnitude by the use of the generally recognized technic—the Baker anchorage.

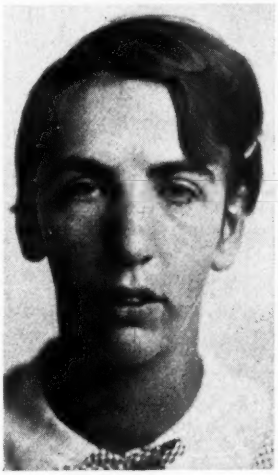


Fig. 1.

Fig. 2.

Intermaxillary anchorage, as developed by Dr. H. A. Baker and Dr. Edward H. Angle, has proved of great value in orthodontia, but as a result of faulty diagnosis this principle has been, and I am convinced is being today improperly applied by many practitioners in a large number of cases.

Does any one in this room still believe that in the treatment of a case of distoclusion it is proper procedure to carry the mandibular buccal teeth forward in the bone? If so, I believe, with all due respect and appreciation of the work of such men as Angle, Baker and others, that you are wrong. Have not a large number of the distoclusion cases which all of us have treated by the use of the Baker anchorage lapsed, more or less? Why did the mandibular incisors drop back and crowd after the removal of the appliances? Because in treatment the teeth were all carried forward of their normal position on the apical base; in fact in many of these cases the crowns at least of some or all

*Read before the American Society of Orthodontists, Buffalo, N. Y., April 30-May 3, 1928.

of the mandibular teeth are too far forward before the work is commenced. I am on record as saying that I believe the apical ends of the roots of buccal teeth are rarely if ever too far distal in the bone itself, particularly in the mandible, and I feel that the time will come when you will all agree with me. I practiced orthodontia for eighteen years before I came to this conclusion, and I had many failures, most of which, with the kind indulgence of the patients, I stuck with in my effort to find out what was wrong.

If the mandibular teeth are too far forward before we commence treatment, no appliance, no matter how efficient or how perfectly adjusted, will

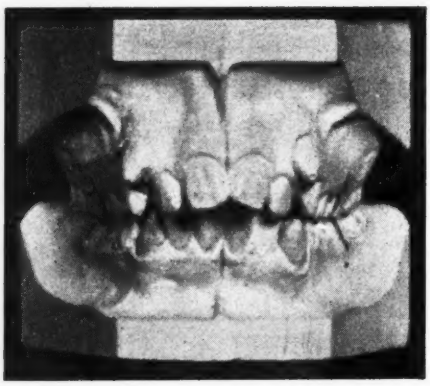


Fig. 3.

Fig. 4.

Fig. 5.

hold these teeth so definitely that they will withstand the constant forward pull of the elastics over a long period of time and not move forward more or less.

Then how are we going to correct these cases? We must utilize extra-oral anchorage or remove some teeth. In extreme cases, such as the one being shown here today to bring out the point I am endeavoring to make, resort was made to both of these expedients.

Figs. 1 and 2 show the photographs of the patient, a girl fourteen years old when treatment was commenced in July, 1926. You will notice a great overdevelopment of the whole maxillary and nasal regions, due to a chronic

rhinitis associated with mouth-breathing for years. It is impossible wholly to correct this overdevelopment.

Figs. 3, 4, and 5 show the original casts. All four first premolars were removed, and the pin appliance (Fig. 6) was adjusted, with U-springs to carry the canines distally, utilizing the balance of the teeth as anchorage. About the end of May, 1927, I realized that it would be necessary to carry the maxillary molars and second premolars distally, and at that time occipital

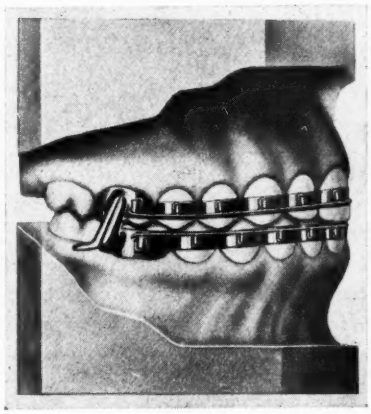


Fig. 6.

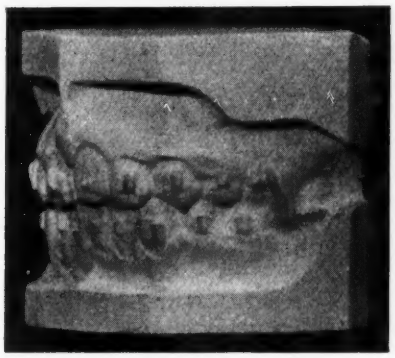


Fig. 7.

Fig. 8.

anchorage was applied—to be worn at night and more if possible. Springs were now applied to carry the second maxillary molars distally, and later all the other teeth, one on each side at a time.

About the middle of February, 1928, the molars and second premolars had been carried back as far as was possible with the amount of time available, and buccal planes were adjusted, as Dr. Rogers would say, "to place the teeth in mechanical advantage," in order that nature might lengthen the mandible slightly. Springs were continued to complete the distal movement of the canines, and the incisors are now being moved lingually.

The patient lives over two thousand miles distant from Toronto, and as she has not been home in nearly two years, she is anxious to go at the end of the present school term in June. The appliances will be left on for possibly six months after she leaves me, and I feel that if no accident occurs during that period which her dentist cannot repair, the result will be fairly satisfactory. She wears plasters over her lips at night and is doing exercises for the development of the masseter-temporal group of muscles as well as those of the lips.

Fig. 7 shows a cast made from a labial impression taken with compound recently, and Fig. 8 is a profile photograph.

2 Bloor E Street.

DISCUSSION

Dr. C. A. Hawley (Washington, D. C.).—I just want to say that I agree very emphatically with what Dr. Grieve has presented, and I want to call your attention just now to what he has said about the action of intermaxillary elastics.

In the discussion of a paper by Dr. Leonard in Baltimore on Saturday, I presented some evidence of the effect of intermaxillary elastics which will soon be published. It is revealed by gnathostatic measurements, and while I have used intermaxillary elastics for over twenty years, I never have had revealed to me what they really did as I have lately.

Dr. Grieve has also spoken of the desirability of moving the molar teeth backward. He says he has done it in this case, but he hasn't proved it.

As the time is very short, I don't want to go further into the discussion of this case report, but I did want to call your attention to those facts.

CASE HISTORY OF AN EXCESSIVE OVERBITE IN THE PRIMARY DENTITION*

Supplementary Report of Progress†

By Frank A. Delabarre, A.B., D.D.S., M.D., F.A.C.D., Boston, Mass.

FIG. 25 shows the models in occlusion with all appliances removed in September, 1927. The overbite has been reduced as indicated by the pencil lines on the lower model by 3 mm. At this time an automatic expansion appliance was placed on the mandibular arch and allowed to remain until April, 1928.

Fig. 26 shows the models in occlusion without appliances in April, 1928. The net gain in vertical growth has been reduced to only 2 mm. There has

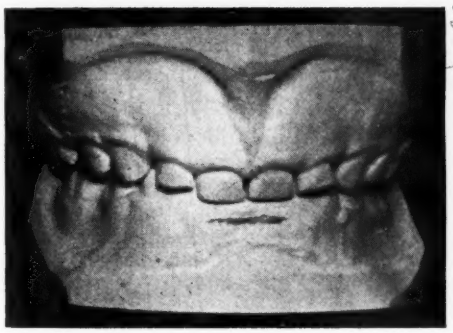


Fig. 25.

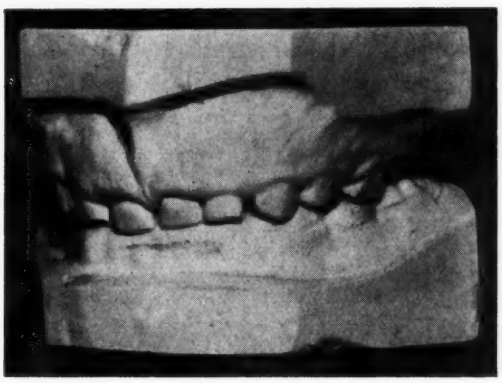


Fig. 26.

been an added gain in the width of both arches of 4 mm. The mandibular permanent central incisors have erupted in good position and the mandibular left first permanent molar is erupting.

Since the case was started, there has been no return of pathologic conditions of the palate, nor has there been any disturbance of functional occlusion. In twenty-two months the child has gained 4½ inches in height, 8 lbs. in weight, the underweight being reduced from 13.6 per cent to 8.7 per cent, which is interpreted as confirming the absence of nervous or physical strain and a marked improvement in the physiologic processes of nutrition.

Upon the eruption of the maxillary left first permanent molar, the present plan is to put on similar extension bite caps on the temporary molars again with a correct incisal overbite to allow a full eruption of the permanent molars. When that is accomplished, the extension caps will be removed and the temporary molars allowed to come into occlusion again.

520 Beacon Street.

*Read before the American Society of Orthodontists, Buffalo, N. Y., April 30-May 3, 1928.

†In the original report read before the Twenty-sixth Annual Meeting of the American Society of Orthodontists, Chicago, May 2-5, 1927, and published in the Internat. J. Orthodontia 14: 309, 1928. Twenty-four illustrations were published.

CASE REPORT AND CLINIC*

By Sydney W. Bradley, M.D.S., Ottawa, Canada

THE principal object in presenting the report of this case, a bilateral distoclusion with linguoversion of the maxillary incisors, is to learn if there is some better and easier way to treat this type of malocclusion than I have been using. If I remember correctly, we were told at the Dewey school that this type was perhaps not so difficult as some other types we have to treat. I have found them quite difficult, and I feel very proud of myself when I get a case of this class finished up nicely, because I find that they are difficult to handle and that they take a long time to treat. We really have two types of malocclusion to treat; first you must tip the maxillary anterior teeth labially, and this changes the case into a bilateral distoclusion with what appears to be a labioversion of the maxillary incisors, but if we tip these teeth out correctly and elongate the premolars while doing this we shall find the upper incisors are not protruding too much. We next have to carry all the mandibular teeth mesially to occlude properly with the maxillary. To do this correctly we must decide if the mental eminence is prominent and if the teeth are well back on the mandible, in which case we shall carry the mandibular teeth forward in the alveolar process, carrying the incisors and canines forward first, then the premolars and then the first molars; the second molars will usually move mesially with the first. And by raising the mandibular premolars and first molars while moving these teeth mesially we correct the distance between the nose and the chin, which is too short, and remove the marked depression in the incisive fossa. If there is a lack of development of the chin, we must somehow elongate the sides of the mandible, and to get the best results this must be done in the second and third molar areas, that is between the first molar and the angle of the ramus.

In this particular case that I am going to show the chin is fairly prominent, but I could not get the mandibular teeth to stay in proper occlusion with the maxillary by using intermaxillary elastics. The patient, a boy fourteen years old when the case was begun in February, 1925, would shove the mandible forward into correct occlusion when told to "close," but just as soon as he unconsciously opened his mouth and relaxed I could see the mandible "flop" distally, and I decided we were far from a finished result.

In May, 1927, I decided to put on buccal bite planes as shown me by Dr. George Grieve of Toronto to see if I could not develop the bone and muscular tissues in the mandible in the areas between the first molars and the angles of the rami. These were worn until May of this year when I began to remove my appliances and place retainers.

For an upper retainer I used a Hawley Vulcanite plate with planes built in the Vulcanite in the canine areas to remind the patient to close forward all

*Read at a meeting of the Alumni Society of the Dewey School of Orthodontia, August, 1928.

the time. For a lower retainer I used a simple bar attached lingually to two bands cemented to the canines.

The patient was a normal healthy boy well developed physically and mentally. His tonsils and adenoids were removed when he was ten or eleven years old. He is now over six feet tall and, as they say at home, "well put together in every way."

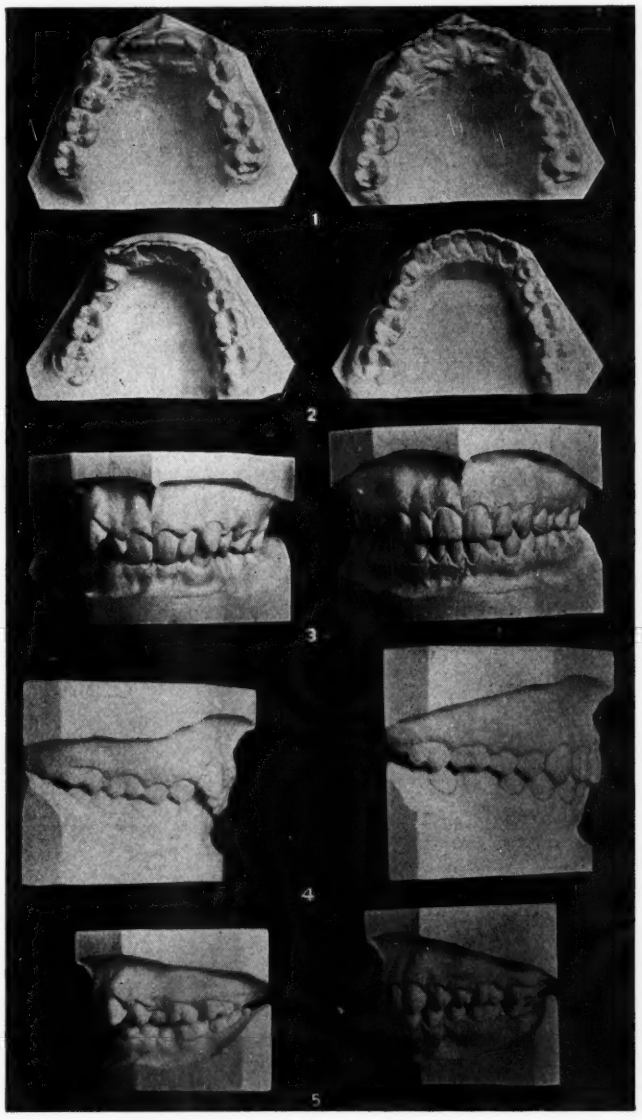


Figure 1 shows occlusal views of the upper teeth before and after treatment.

Figure 2 shows occlusal views of the mandibular teeth before and after treatment.

Figure 3 shows views of the anterior teeth, showing the pronounced supraclusion of the incisors, or rather the infraclusion of the premolars and molars. The corrected case is shown on the right side.

Figure 4 shows right side before and after treatment.

Figure 5 shows left side before and after treatment.

Figure 6 shows anterior views of the occlusion of the teeth before and after treatment.

Figure 7 shows views of the full face before and after treatment.

Figure 8 shows profile views of the face before and after treatment.

Figure 9 shows lateral views of the buccal bite planes attached to the main alignment wires.

Figure 10 shows occlusal views of the planes and also the type of retainers used in this case.

Figure 11 shows four pairs of tungsten pointed pliers and a pair of artery forceps used in soldering. The tungsten points are made of 0.030 round gold-plated tungsten wire, soldered to ordinary steel soldering pliers with 22 K. solder. One pair has ordinary fine points; one pair has fine grooves

running the long way of the wire; the other has cross grooves and the third pair takes the place of the angle band soldering pliers. The hemostat (small mosquito forceps) has delicate curved points and is used to hold bands and wires while soldering. When locked it has a positive grip.

Fig. 9. Fig. 10.

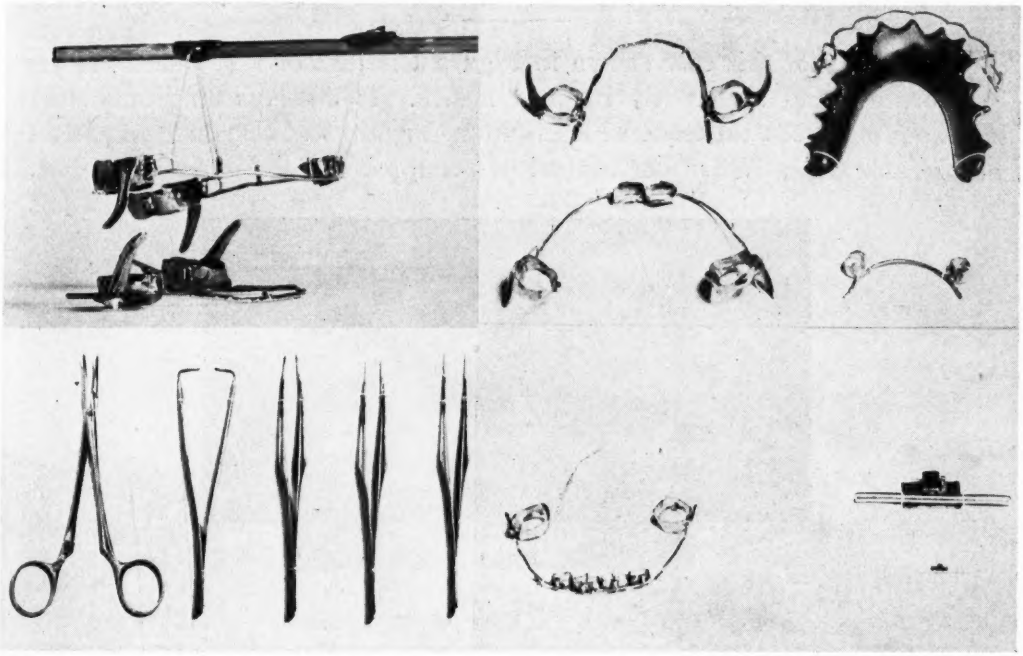


Fig. 11. Fig. 12.

Figure 12 shows a square tube with locking device which I find much better than the half round tube formerly used on incisor bands. A round pin can be used in it just as well as a square one and works much nicer than when used in the old half round tube; and if you wish to stabilize the tooth, you can use the square pin. The tubes are 0.010 inch long and take a 0.023 round wire or a square wire 0.023 inches to a side

142 Laurier Avenue W.

CASE REPORT OF IMPACTED INCISORS SHOWING TREATMENT AND RESULTS*

By Dr. Clifford G. Glaser, Buffalo, N. Y.

THE history of this case shown in Figure 1 is that of a boy seven to eight years old and apparently in good health. It involves an injury to the deciduous right central tooth which tightened again and remained in place for considerable time. When one central had erupted and the other had failed to

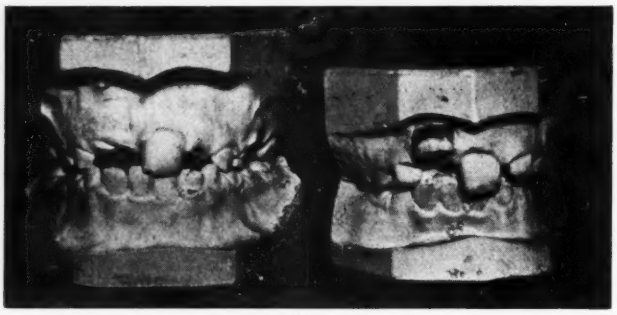


Fig. 1.

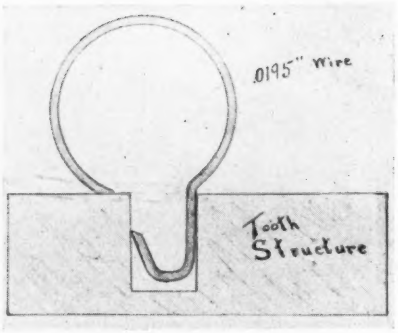


Fig. 2.

do likewise, the parents were alarmed. Upon examination we find radiogram shows the tooth pointing about 60 degrees to the labial with the crown at the base of the right nostril and the apex of the root producing a slight bulge in the roof of the mouth.

The treatment employed consisted of making an incision to the lingual side of the crown. This was done in such manner as to leave as much mucous membrane on the labial surface as possible, i.e., the incision was made rather low instead of near the attachment of the lip to the jaw.

After the incision a pack of temporary stopping was used to keep the opening. The technic of packing, I believe, is a very important part of the treatment of these impacted teeth cases.

*Read before the American Society of Orthodontists, Buffalo, N. Y., April 30-May 3, 1928.

A technic which I have found to work very satisfactorily is to place a small amount of stopping at the depth of the opening against the tooth under pressure. The instrument should be slightly wet to prevent sticking, and should be nearly large enough to fill the aperture and flat on the end. The stopping is held by suction. After this primary packing is placed, a secondary packing is placed in the same manner to bring it sufficiently flush with the surface. When the aperture has been treated this way, it seems that it heals very well, and there is practically no soreness. But when the packing is loose, there is granulating tissue formed which becomes sore and bleeds easily.

The appliance is placed to protect the packing, and after a week, healing has taken place and we may make our attachments to the tooth.

Fig. 3.

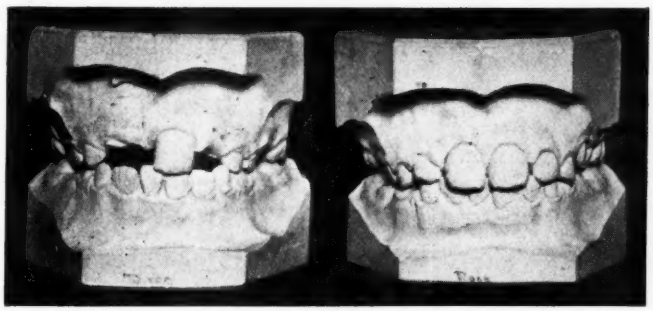


Fig. 4.

In this case a small hole was drilled into the cingulum. It had to be very shallow on account of the lack of maturity of the tooth. The hole was of a certain size so that a small spring with a sharp lip would fit tightly into it.

This attachment shown in Figure 2 was so designed after a considerable amount of dissatisfaction with the screw attachments. In Figure 3 is shown the attachment tied to the swinging end of the ligature. The rest of this picture has nothing to do with the case.

After the hole in the tooth was filled with cement, the attachment was inserted. The cement was used to seal the hole and to secure additional strength. When the cement was set, the tooth was moved down to place in the usual manner of tooth movement by attachment of the appliance.

Fig. 4 shows the casts of before and after treatment of the case. The time of treatment involved about one year and three months. After this time it was retained for about six months when the patient lost the retainer. As the function of all surrounding tissues appeared to be normal, the patient was dismissed without another.

Fig. 5.

Figure 5 shows a radiogram taken at the beginning of treatment and one taken recently. The patient is now thirteen to fourteen years of age. The last radiogram shows that the tooth was bent during treatment. And an examination of the mouth shows that it is retaining its position very well.

675 Delaware Avenue.

Clinics

LOOP LOCK FOR LABIAL ALIGNMENT WIRES*

P. G. Spencer, D.D.S., Waco, Texas

TO OVERCOME the need of a ligature wire to retain plain labial alignment wires in position, a slight change has been made in the stop loop.

Fig. 1 shows the beginning of the loop; 0.025 wire is soldered one-fourth inch forward to the usual position. This permits greater elasticity and avoids any danger of breakage at soldered joint.

FIG. 1

A - Buccal Tube
B - Labial Arch .038
C - Locking Wire .025

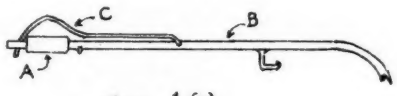


FIG. 1 (B)

FIG. 2

Fig. 1-*B* shows lock wire lying just above alignment wire, looped upward, and locked behind the tube, while using intermaxillary elastics. As the anterior teeth are retracted, the loop may be lessened so as to maintain alignment wire in proper position. Solder, to form a stop, may be placed on the wire just anterior to the tube.

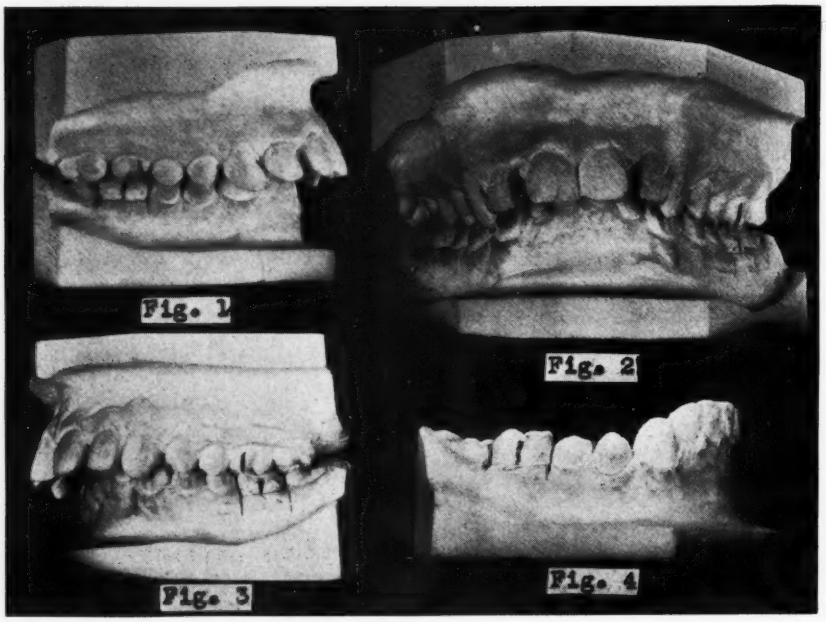
Fig. 2 shows another version, giving both a stop and lock with the same loop. The wire is soldered on the opposite side of the alignment wire to that in Fig. 1, then bent backward to a position directly in front of the tube. It is then bent to fit snugly between the tube and band, then to form a loop, and is locked around distal end of tube as in Fig. 1-*B*. This is a simple procedure yet will be found very efficient in treatment of most cases.

*Presented at a meeting of the American Society of Orthodontists, Buffalo, N. Y., May 2, 1928.

CLASS II CASES*

By Horace L. Howe, Boston, Mass.

CASE 1.—Patient was fifteen years old. Class 2, division 1: this was a case of excessive elongation of lower incisors with extreme overbite. Models illustrated by Figs. 1, 2 and 3 were made October 8, 1926. Treatment consisted of maxillary labial arch with intermaxillary elastics. To depress the mandibular incisors hooks made to engage the tops of the incisors were soldered to the lingual arch. Figs. 4, 5 and 6. The depression of the four incisors was quite marked leaving the canines quite high. These in turn



were depressed but with wire loops engaging the points of the canines. Figs. 4 and 6 show the comparison of the two lower models.

Figs. 7, 8 and 9 show the present condition of occlusion. Two small inclined planes attached to central bands help to maintain the occlusion.

Case 2.—P. W., was five years old. Class 2, division 1: this case was a protrusion of the maxillary incisors with distoclusion. Figs. 10 and 11 show the case on October 21, 1927; appliance was adjusted to the maxillary arch. Expansion was brought about in the canine and first deciduous molar region chiefly. Figs. 12 and 13 show condition in March, 1928. The protrusion is reduced and the occlusion improved. No elastics were used and no appli-

*Presented at the meeting of the American Society of Orthodontists, Buffalo, N. Y., April 30-May 2, 1928.

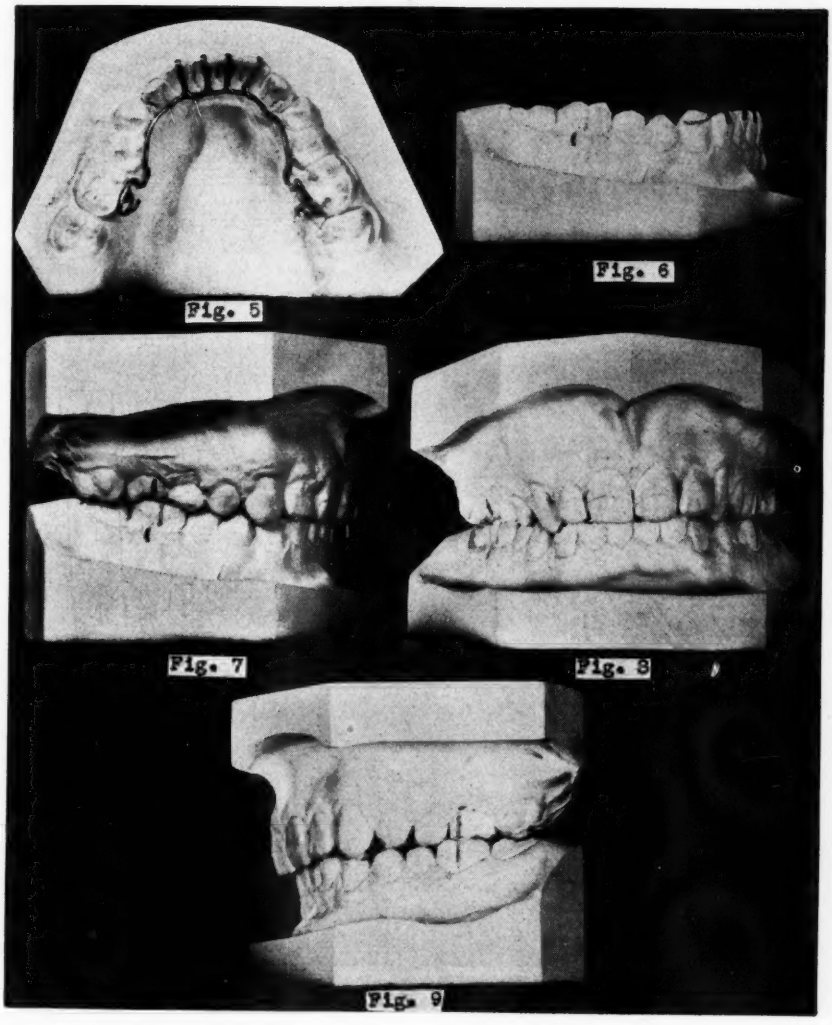
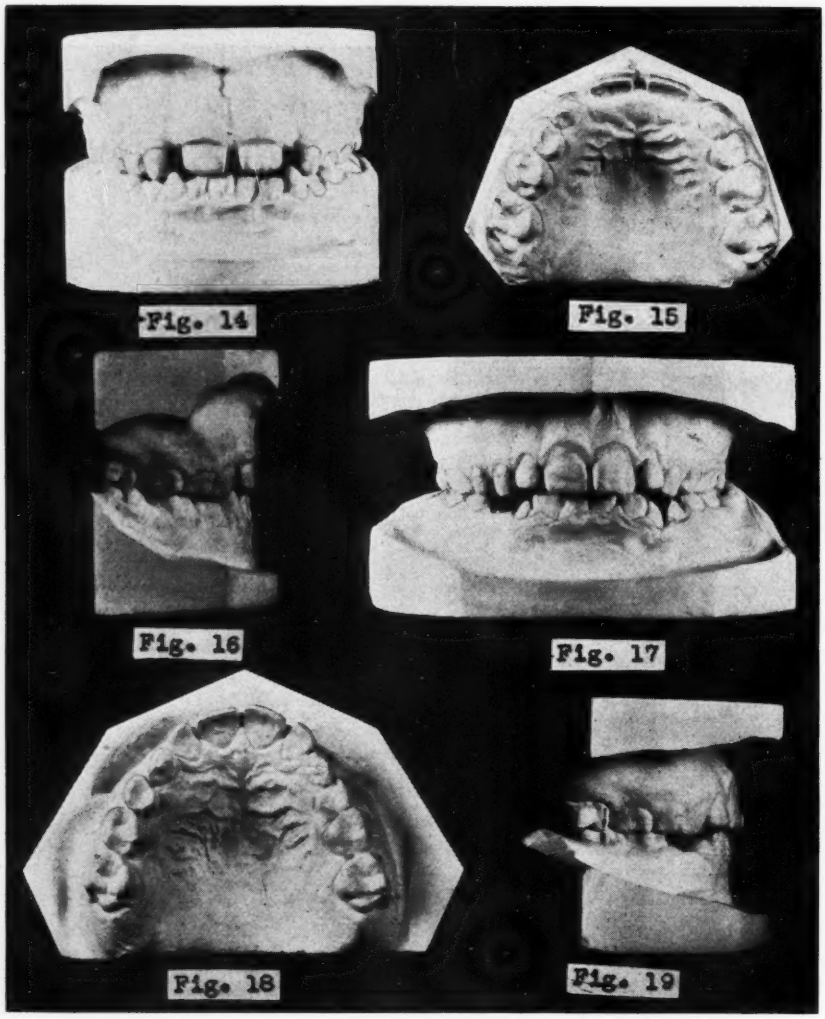


Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9

ance was put on the mandibular arch, although one was made with the expectation that it would be necessary.

CASE 3.— M. H. was six years, eight months old. Class 1: Width of arch in second deciduous region was 29 mm. Width of arch in maxillary canine region was 21 mm. Radiographs showed all permanent teeth present. Room for both maxillary laterals and mandibular laterals was rather small. Models



illustrated by Figs. 14, 15 and 16 were made December, 1924. Models illustrated by Figs. 17, 18 and 19 were made Feb. 12, 1928. No appliances have been used. Natural growth and function have brought about ample room for all laterals both maxillary and mandibular. Width between maxillary second deciduous region is 31 mm. Width in maxillary canine region is 23 mm. showing 2 mm. of growth.

196 MARLBOROUGH AVENUE.

A DEFINITE METHOD OF ROUTINE*

By Otto J. Sorenson, D.D.S., Greenwich, Conn.

I USED Dr. Frederick L. Stanton's pantographic surveyor in establishing this particular method of routine.

The study of the case began with a model which was made from an accurate plaster impression. The model was surveyed to show the positions of the teeth in malocclusion (Fig. 1).

Fig. 1.

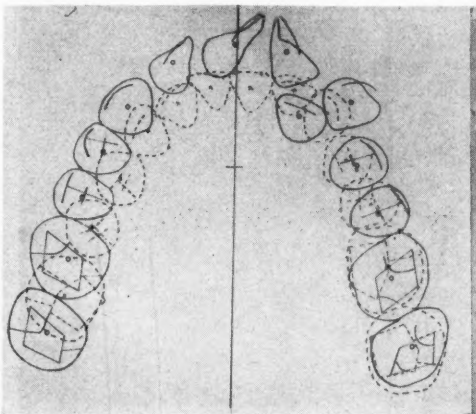
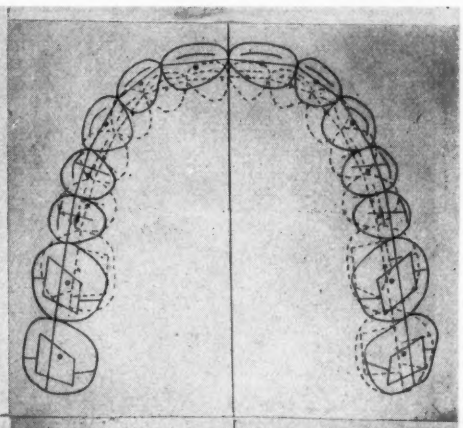
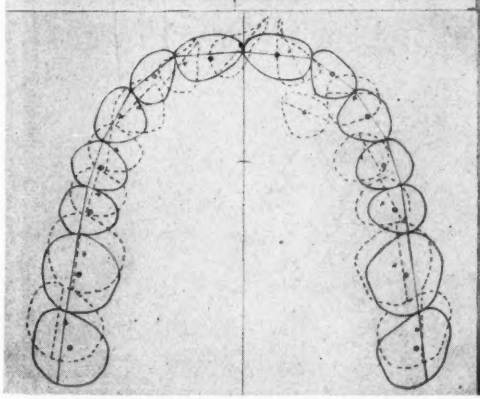


Fig. 2.





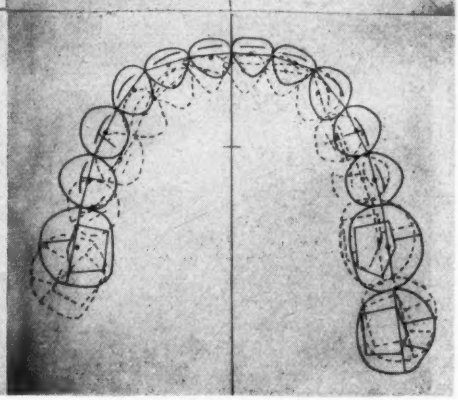


Fig. 3.

Fig. 4.

Fig. 1.—Malocclusion map (maxillary teeth solid line, mandibular teeth broken line). Maxillary right lateral is in a lingual position to the mandibular teeth. Mandibular left side is collapsed closing the first molar space and is lingual to the maxillary teeth.

Fig. 2.—Occlusion map, or final objective of the treatment (maxillary teeth solid line, mandibular teeth broken line). All the teeth are drawn in normal relations except the mandibular left second molar, which is placed in the position of the missing first molar.

Fig. 3.—Maxillary treatment sheet. Malpositions in broken line, final objective in solid line. The right side requires lateral expansion which is measured in millimeters; the central to be rotated mainly; the canine to be moved backward and rotated. Left side requires very slight lateral expansion; central and lateral to be rotated and moved to the left. In this way sufficient space is gained to bring the right lateral forward.

Fig. 4.—Mandibular treatment sheet. Malpositions in broken line, final objective solid line. The right side requires lateral expansion; second premolar space to be increased to accommodate erupting tooth—left side to be expanded and carried forward.

*Clinic presented at the meeting of the American Society of Orthodontists, Buffalo, N. Y., April 30-May 2, 1928.

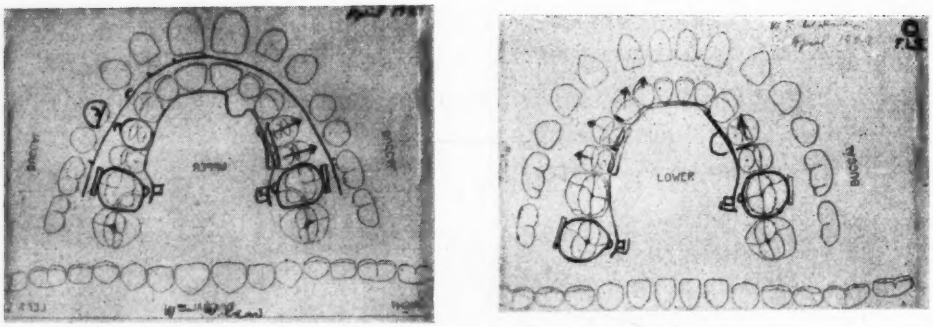
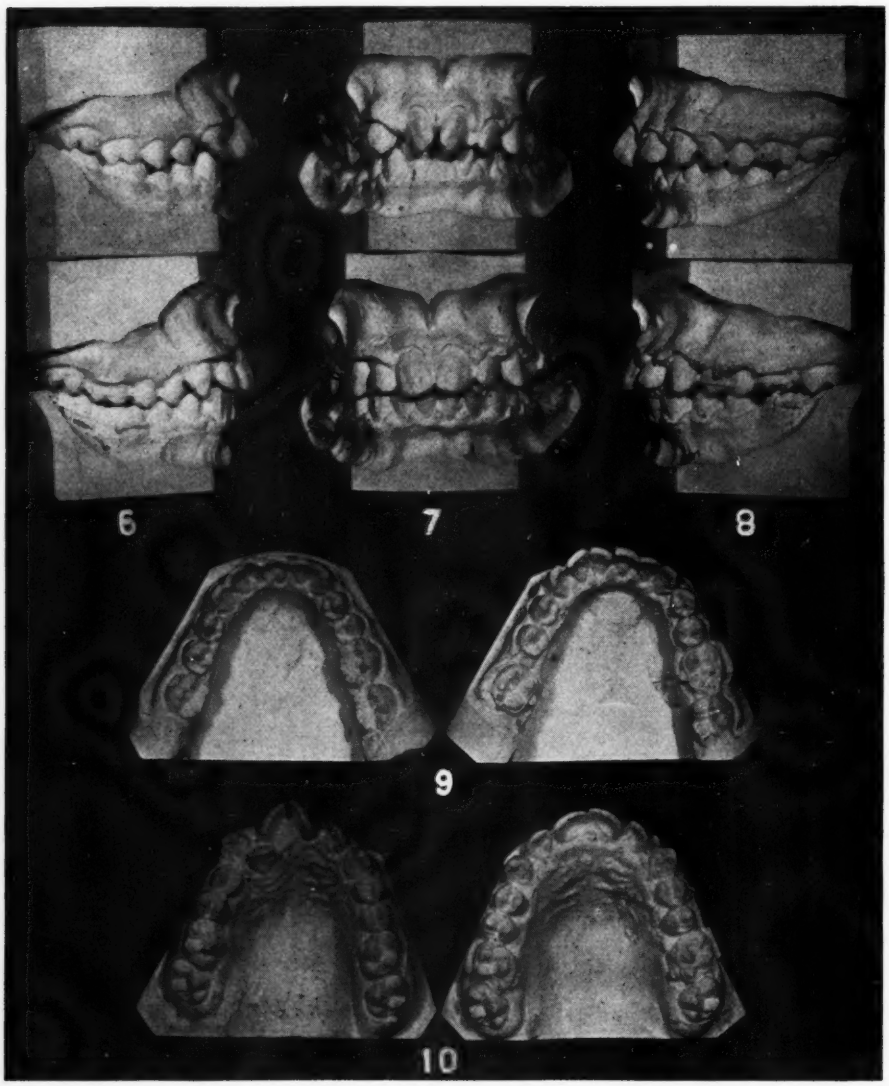


Fig. 5.—Design of appliance used at start.



Figs. 6, 7, 8, 9 and 10 show the original and progress models. Elapsed time thirteen months.

From the map of malocclusion (Fig. 1) an occlusion map (Fig. 2) was drawn. This map shows the objective of the treatment and is made according to Dr. Stanton's method of arch predetermination.

The next step consists of maxillary and mandibular treatment sheets (Figs. 3 and 4). The treatment sheets show the amount of movement as well as the path of movement of each tooth to reach the final objective position of the occlusion map.

The last step, the appliance design (Fig. 5), is determined by the interpretation of the treatment sheets.

This method is especially advantageous because it graphically records the relative position of the teeth, thereby removing the element of guesswork due to error in ocular diagnosis.

1 West Elm Street.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

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CYSTS OF THE MOUTH AND JAWS

By Arthur B. Crane, D.D.S., Washington, D. C.

THE common occurrence of cysts in the mouth and jaws makes this type of pathology of especial interest to the dentist. While they are nearly always benign tumors of slow growth, they may cause considerable deformity, and because of their environment they are always liable to become infected.

Cysts occur in such great variety and arise from so many causes that they are difficult to classify or even to define. The word cyst is derived from the Greek and means pouch or bag, but it is really the combination of the sac and its fluid contents which constitutes the cyst.

Marshall[1] gives a comprehensive definition as follows: "A cyst is a cavity, either natural or newly formed, filled with material more or less fluid or pulpaceous and surrounded by an investing membrane or capsule, which separates it from the surrounding tissues.

Many varieties of cysts occur in the mouth and jaws, varying in size from the almost microscopic retention cysts of the mucous glands to enormous dentigerous cysts of the mandible. For convenience they may be divided into cysts of the soft tissues and cysts of the bone.

With the exception of the dermoid and hydatid cysts, which are of such infrequent occurrence in the mouth that they will not be considered here, the cysts of the soft tissues are retention cysts. These may arise from the mucous glands, the glands of Blandin-Nuhn or the sublingual salivary glands.

Cysts of the mucous glands may occur anywhere in the buccal mucosa, the most prevalent sites being the cheeks and lips. They vary in size from one to twenty centimeters. The form is a rounded tumor, pink or bluish in color, and soft in consistency. They rupture easily, discharging a viscid or serous fluid, after which they disappear, only to recur sooner or later. When they are in such a position that they are frequently injured in mastication, the overlying mucous membrane becomes thickened, so that they simulate papil-

lomata or fibromata in appearance. If they become infected, they usually rupture spontaneously and after drainage resume their original characteristics.

The treatment of retention cysts of the mucous glands consists of grasping the mucous membrane at the periphery of the growth with rat-toothed forceps, and by careful dissection close to its boundaries the cyst may be removed in its entirety without rupture. The lips of the resultant wound are sutured together, and healing is generally uneventful.

Cysts of the glands of Blandin-Nuhn occur on the tip of the tongue as a pale red, transparent, painless tumor. While not frequently encountered, they may become as large as a pea before the patient seeks relief. The treatment is the same as for cysts of the mucous glands.

Cysts of the floor of the mouth are usually termed ranula. They may form in the ducts or in any part of the sublingual or submaxillary salivary glands, forming a soft rounded swelling under the tongue between the lingual frenum and the alveolar border displacing the tongue upward. As it increases in size, the ranula may extend to the other side of the mouth and being bound down in the middle by the frenum, may appear as a double tumor. The bulging surface is pink to greyish in color and is often marked by the ramification of the distended surface vessels. As it increases in size, it may cause a noticeable enlargement under the chin.

Acute swellings of the salivary glands caused by temporary obstructions of their ducts by salivary calculi or foreign bodies should not be confused with ranula, which is slow growing and painless. Its softness will serve to differentiate it from Ludwig's or Vincent's angina, which binds the tissues of the floor of the mouth into a board-like mass.

The possibility of a cyst arising from the vestiges of the thyroglossal duct should be kept in mind, as in such event the lower portion of the cyst may be lost in the depth of the tissues or even extend to the hyoid bone.

The most certain treatment for ranula is complete extirpation in the manner already described. This can usually be accomplished through intraoral incisions, but very large cysts of the submaxillary gland may require approach through the skin. After the cyst wall is exposed, it can usually be enucleated by blunt dissection. If the cyst ruptures during this process, it is best to make a free incision, evacuate the fluid contents, and then place the fingertip into the cavity as a guide to continued blunt dissection.

When it is deemed inadvisable to remove the entire cyst, the lower part of the cyst wall may be left, and its epithelial lining will gradually replace the normal mucosa of the floor of the mouth. This is known as the Partsch operation. The cyst is incised and evacuated. The upper wall is then grasped with forceps and cut away with scissors in such a manner as to prevent overhanging margins. The cut edge of the mucous membrane is now fastened all around to the edge of the remnant of the cyst wall by means of a continuous button-hole suture. In very large ranula this is usually the operation of choice.

Cysts of the jaws have been classified with the odontomata by Bland-Sutton.[2] There are two cystic varieties of odontomata; epithelial and follicular. To these may be added the radicular cyst, which is not strictly speaking a newgrowth.

Radicular cysts, sometimes called dental cysts, are always primarily associated with the root-apex of a pulpless tooth. They vary in size according to their location and development (Fig. 1). Rarely larger than a pea in other locations, they sometimes become as large or even larger than an English walnut when associated with the upper lateral incisors and may expand until they occupy more than half the body of the mandible when associated with lower premolars. New[3] advances an interesting theory as to the frequent location of radicular cysts in the incisor and premolar region. He points out that the typical mammalian dentition contains a third incisor, a third premolar and a fourth molar, which are missing in man, and suggests that these cysts may arise from supernumerary embryonic centers. This hypothesis may also explain the increased expansion of cysts in the same regions.

Radicular cysts develop by an interesting pathologic process which is dependent upon the fact that the normal pericementum often contains chains and clusters of epithelial cells lying in close proximity to the cementum. The most widely accepted theory as to the origin of these cells is that of Malassez,[4] who regards them as remains of the epithelial sheath of the enamel organ.

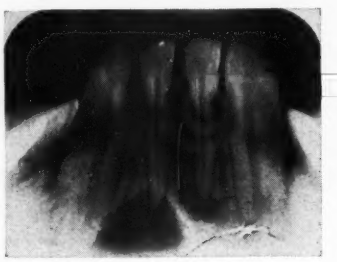

Fig. 1.—Radicular cysts of mandibular central incisors; a late result of traumatic devitalization.

The initial step in the formation of a radicular cyst is the death of the tooth pulp. When an infective process of low virulence or other mildly irritating factor causes a periapical granuloma, which is held in check by a normal resistance of the tissues, these epithelial elements are stimulated to increased growth by the slight inflammatory action. The central cells soften and undergo fatty degeneration, and other cells form strands about the developing necrotic area. This is the beginning of the cyst wall. As the necrotic area becomes larger, the epithelial layer thickens and completely surrounds it, while the connective tissue elements form the fibrous capsule.

Many radicular cysts present a history of pulp devitalization by traumatism early in life. Cultures from such cases are usually negative. This leads to the interesting hypothesis that the cyst may be the result of infarcts or extravasation in these cases.

As the fluid contents of the cyst increase, the cyst wall expands, painlessly displacing the adjacent osseous substance in such a manner that a shell of dense bone is formed about the advancing tumor. In the radiogram this bony encasement is shown by the dense white line which indicates the definite boundaries of the cyst and serves to differentiate it from the dental granuloma.

As the cyst expands it may come into contact with the root apices of one or more adjacent teeth, but contrary to occasional thoughtless statements in literature such teeth do not become involved in the pathologic process (Fig. 2). The cyst wall merely folds over and invaginates the root apex, and the health of the tooth is in no way affected. Pressure may cause a greater or less displacement of the tooth, but even though the radiogram may appear to show it, a

Fig. 2.—Radicular cyst of maxillary right lateral incisor. The central and canine are invaginated by the cyst wall. These vital teeth were not injured by the removal of the cyst.

Fig. 3.—Residual cyst in mandibular premolar region.

Fig. 4.—Infected residual cyst, maxillary lateral incisor region. Note the breaking down of the definite bony outline.

tooth with a vital pulp can have no part in the formation of a radicular cyst. The extraction of teeth which are vital to preoperative pulp test is rarely justifiable.

The offending tooth will not give a vital response. In order to eliminate the tooth-socket as a portal of postoperative infection, this tooth and any other pulpless tooth whose root apices are in relation with the cyst wall, should be extracted as a preliminary operation. This will give an opportunity for a confirmation of the diagnosis, for the typical cyst fluid will pour out of the

socket when the causative tooth is extracted. After the sockets have completely healed, the operation for the enucleation of the cyst may proceed.

Small radicular cysts will usually retain their attachment to the root and come away with it when the tooth is extracted. If they are much larger in diameter than the tooth-socket, they will tear loose and remain in the alveolar bone. In this event the cyst wall may usually be dissected free and removed through the tooth socket with a small curette. In other cases, however, a window must be made through the alveolar plate. If the cyst wall or even a part of it is left, a residual cyst may result. Such cysts are frequently found in the lower premolar region as large as an olive (Fig. 3). When situated in the premolar or molar region of the maxilla, they are often difficult to distinguish in the radiogram because of their similarity in appearance to the lower portions

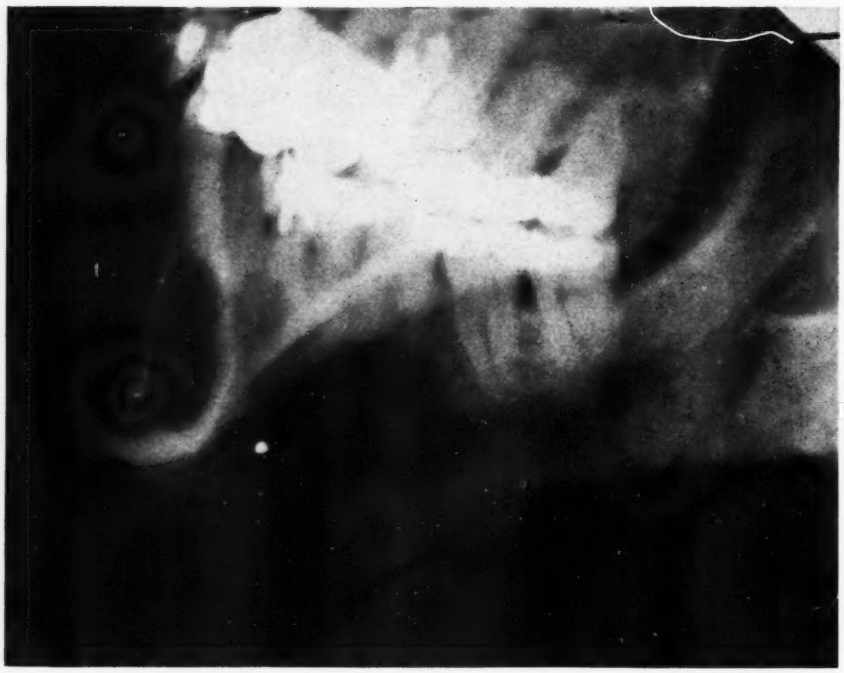

Fig. 5.—Large radicular cyst of mandibular right second premolar, extending from mandibular right first molar to left mandibular canine.

of the maxillary sinus. In the region of the upper lateral incisor they may cause great deformity by displacement of the nose.

Radicular cysts and residual cysts are subject to secondary infection. As a result they may lose their epithelial lining, the limiting wall may be broken, and a fistula become established. When there has been a chronic course of infection with alternating periods of fistula formation and repair, the dense white line which marks their limitation in the radiogram may become so indistinct that they will be difficult to differentiate from large granulomata or necrotic areas (Fig. 4). Here the history is of utmost importance in making a diagnosis.

The treatment of large radicular cysts, whether primary or residual, sterile or infected, is the same (Fig. 5). It consists of removing enough of the outer alveolar plate to permit the withdrawal of the cyst wall in its entirety. The pri-

mary incision is then immediately closed by interrupted sutures. Wherever feasible the so-called dead-space in the bone should be reduced to the smallest possible dimensions. In the mandible this may be accomplished by freeing and undermining the flaps in such a manner that after they are sutured together there will be enough relief to permit the tissues to be drawn into the cyst cavity and sutured to the opposite plate of the mandible by through and through sutures. Often the bone is so thinned that it may be pierced with stout needles, but sometimes it is necessary to drill holes with a dental bur (Fig. 6).

In the maxilla radicular cysts often expand into the hard palate and occupy a space between the roof of the mouth and floor of the nasal fossa. In such cases much dead-space may be eliminated by suturing through the nasal mucous membrane. It is not necessary to let these sutures remain for more

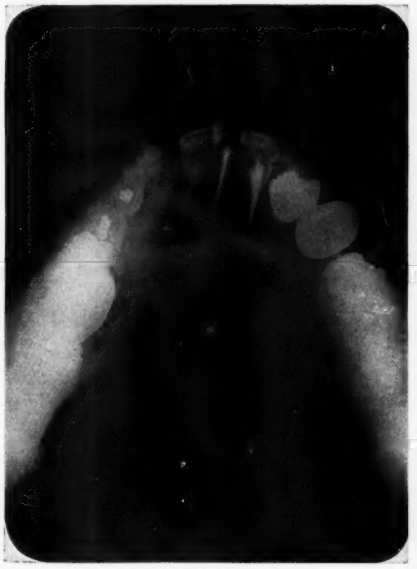

Fig. 6.—Postoperative result of immediate suturing. Note uniform density of new bone growth.

than three or four days, for by that time the blood clot will have sufficiently organized to hold the tissues in place. Harrison[5] of Richmond has suggested the use of small pearl buttons on either side to prevent the sutures from pulling through.

Cyst cavities should never be packed with gauze as a primary operative procedure. Occasionally the blood clot will become infected, making it necessary to remove the sutures and pack the wound. Acriflavine gauze is the packing material of greatest merit for use in the mouth, but postoperative care of packed cases may extend over a period of months.

Follicular odontomata occur in connection with the expanded follicle of an unerupted tooth. They are commonly known as dentigerous cysts. They occur as a rounded, painless enlargement of the jaw and are covered by normal skin and mucous membrane. The wisdom teeth and the canines are the ones most often associated with these cysts, which arise from an overgrowth

of the epithelial paradental rests in the tooth follicle. From this point dentigerous cysts expand in the same manner as radicular cysts, a thin shell of bone forming about the periphery of the enlarging tumor.

Diagnosis of dentigerous cyst is easily made from the radiogram even before any noticeable deformity has occurred. A large radiolucent area with rounded margins which are definitely bounded by a radiopaque line, within the confines of which is a partially or wholly developed tooth, such is the radiographic evidence of a dentigerous cyst (Figs. 7 and 8). An exploratory punc-

Fig. 7.—Very small dentigerous cyst of left maxillary central incisor. Patient was six years old.

Fig. 8.—Microscopic section from cyst wall shown in Fig. 7. *A*, epithelial lining.

ture of the growth will give vent to a flow of glairy serous fluid, which establishes the diagnosis beyond question.

Dentigerous cysts may become enormous and produce great deformity. They have a tendency to expand the outer rather than the inner alveolar plate, and when the bone is sufficiently thinned, they have a characteristic parchment-like crepitation upon pressure. While this is a disease of youth (Figs. 9 and 10), cysts in connection with unerupted deciduous teeth are so rare as to be almost unheard of. Occasionally the cyst may contain numerous bodies, more or less tooth-shaped and composed of dental tissues. Such cysts are known as compound follicular odontomata.

Treatment as in other cysts consists of the complete removal of the cyst wall. This can be accomplished, except in enormous cases, through intraoral incisions. Complete exposure of the outer bony wall should be obtained in order that the thin bone may be readily removed. This can often be accomplished with stout, short-bladed scissors. When chisels are required, hand pressure is usually sufficient to cut the bone away. The opening in the bone must be made large enough to allow freedom of approach in blunt-dissecting the more remote portions of the cyst wall. The attempt is made to free the cyst from its bony capsule as thoroughly as possible before it ruptures. When this occurs, a free incision should immediately be made and the cyst contents, including the tooth, evacuated. A finger is then inserted through the incision as a guide for the instrument in completing the freeing of the cyst wall. The

Fig. 9.—Dentigerous cyst involving the whole structure of the mandible from the right second premolar to and including the left ascending ramus. Patient about fifty years old. Intra-oral operation and immediate closure.

cyst wall is grasped with forceps and removed, intact if possible, by gentle traction. The resulting wound may be packed with gauze and allowed to fill by granulation, provided it is too large to permit immediate closure by the method previously referred to.

In successful cases the jaw will gradually resume its normal contour, and a new cortical layer will be formed where the expanded plate has been removed.

Epithelial odontomata, like the radicular cysts, arise from the paradental epithelial débris of the enamel organ. They are commonly referred to as multilocular cysts of the jaws. The tumors appear in young adults, most frequently near the angle of the jaw, forming a round, immovable mass covered with normal mucous membrane. When they occur in the upper jaw, they may

expand into the maxillary sinus, or bulge the ala of the nose. They are slow growing as a rule but may have periods of rapid increase without apparent cause. If allowed to persist for many years they become prodigious and produce grotesque distortions of the face. If they become infected, they expand with great rapidity and soon establish a fistula, after which growth ceases for a time.

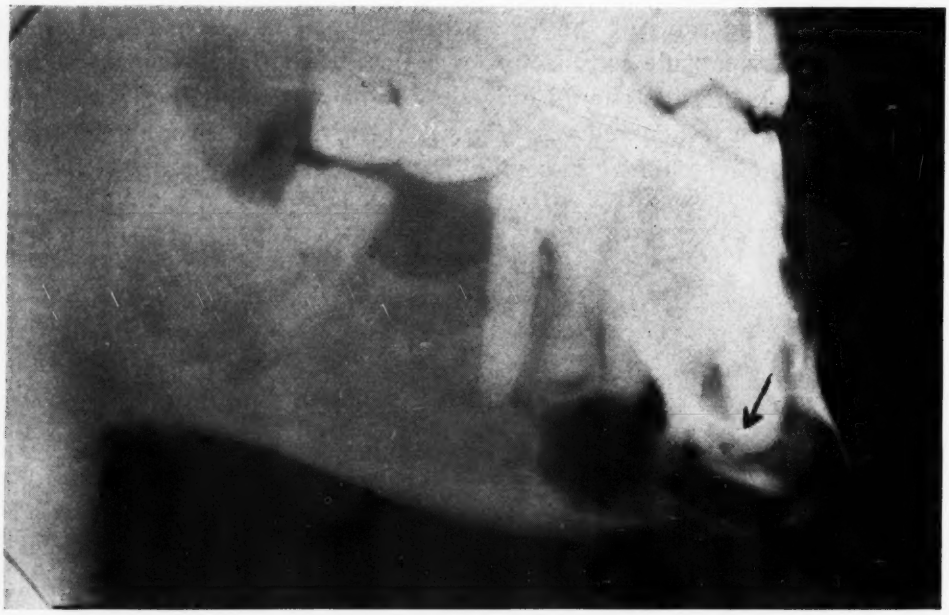

Fig. 10.—Right side of case shown in Fig. 9. Arrow indicates canine tooth, which was the etiologic factor.

Fig. 11.—Multilocular cyst of mandible. Recurrence of dentigerous cyst.

Multilocular cysts may contain an unerupted tooth, in which case they would be multilocular dentigerous cysts. More frequently, however, they occur independently of the teeth or as recurrences of radicular or follicular cysts (Fig. 11).

The effect of the growth of multilocular cysts upon the surrounding tissues in no wise differs from the effect of other cysts of the jaws. The bone

may be bulged to parchment-like thinness, and neighboring teeth may become irregular or even loosened. This growth has sometimes been classed with the borderline tumors; but this seems to be a fallacy, as there is never recurrence following complete extirpation, and metastasis is unknown. There is no glandular involvement nor ulceration unless the tumor becomes infected.

Unnecessarily severe and mutilating operations, such as excision of half of the jaw and block dissection of the glands of the neck, have often been performed and even proudly reported in literature. Such designations as adamantine epithelioma, cystic carcinoma, adenosarcoma, and adenocarcinoma are dangerously misleading and are doubtless responsible for many ruthless operations.

Malignant growths may undergo cystic degeneration and simulate multilocular cysts. Carcinoma usually appears later in life and ulcerates early. Sarcoma is more difficult to differentiate but grows with much greater rapid-

Fig. 12.—Osteitis fibrosa cystica. Numerous cysts are found associated with necrotic bone areas and granulation areas. Ordinarily one or more fistulas communicate with the mouth or drain externally.

ity. By the time that either form of malignancy distorts the contour of the jaw, there will be an associated glandular involvement.

The radiogram will show a rounded radiolucent area in the bone limited by a dense white line which represents the bony capsule of the cyst. Within the confines of this limiting wall will be seen the many compartments or loculi of the growth outlined in turn by the bony septa which divide them. Upon section the growth presents solid and cystic areas. The cystic areas vary in size, averaging about a centimeter in diameter although many of them are almost microscopic. Some of these areas have a shell of thin bone about them, and all contain the characteristic cyst fluid. The solid areas of the tumor are white and granular in appearance. Microscopically the cystic areas are lined with epithelium, while the solid areas are composed of a fibrous tissue stroma surrounding irregular masses of epithelial cells.

The treatment is the same as described for dentigerous cysts. If there is any possible question of malignancy, however, a frozen section should be made before completing the operation.

A condition somewhat resembling multilocular cyst and therefore included in this paper, is osteitus fibrosa cystica. This is a chronic inflammatory condition by which the bone marrow is transformed into fibrous tissue, mucoid or fatty material. The trabeculae become massed about multiple cysts. These cysts are lined with fibrous tissue and filled with clear fluid. The bone expands, but the disease does not penetrate the cortex.

But little is definitely known of the cause of this disease. It sometimes occurs in multiple form, attacking various long bones at the same time. It is quite rare in the mandible. Harris[6] attributes its occurrence to changes in calcium metabolism, endocrime disturbances or the introduction of infectious agents.

It is entirely benign and does not recur after complete removal. The operative procedure is similar to cyst operations, except that provision must be made for postoperative drainage.

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THE FARRAGUT.

MEDICODENTAL CASE RECORDS: SIXTH REPORT[1, 2]

A Clinico-Pathologic Study

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INTRODUCTION

THE medicodental case records in this series of reports have been limited entirely to the sequelae of oral *focal infection.* This report of a case of cancrum oris, which is a severe local destructive process by direct extension, does not, therefore, come strictly within the set limitations of the present serial study. However, because of the many unusual features of this case (principally the incidence of the disease in an adult) and the availability of a complete and detailed chronologic clinical record, it is believed that the following report may be of some value to the literature of both dentistry and medicine. Furthermore, this report exemplifies the type of case in which proper treatment can be instituted only by the rational cooperation of the physician and the dentist, for, since the treatment is both local and constitutional, the case falls neither into the practice of medicine alone nor into the practice of dentistry alone.

The occurrence of this case antedates the beginning of the present medicodental case-record study, and in consequence details of general physical examination and laboratory data, which have become standards of this series, are incomplete.

CASE M-2; CANCRUM ORIS (NOMA)[3]

General History.—The patient, a man fifty-five years old, a building contractor, was seen in consultation on January 23, 1924. His chief complaints were pain and swelling in the jaws and inability to open them. The condition was caused by an abscess associated with a pericoronal infection of the right mandibular third molar. No data of importance were obtainable regarding early childhood or adult medical history or family history. For several years the patient consumed large quantities of Scotch whiskey daily. For five years he had had gastric reflexes with pain and belching one hour after meals. Three years ago he noticed a double direct inguinal hernia which was corrected surgically soon afterward. In November, 1923, a medical examination was made and a "hob-nailed" liver was diagnosed. At that time the border of the liver was not palpable below the costal margin, and by percussion it was evident that the lower edge was probably in normal position. There was

[1]Presented by title at a session of the Sixth Annual Meeting of the International Association for Dental Research, Hotel Mayflower, Washington, D. C., March 25-28, 1928. An abstract was published in the *Journal of Dental Research,* 8: 449, 1928.

[2]The previous reports were published in the *Journal of Dental Research:* (1) 6: 283, 1926; (2-4) 7: 115, 275, 457, 1927; (5) 8: 73, 1928.

Reprinted from *The Journal of Dental Research,* 8: 579, 1928.

[3]The condition of cancrum oris is described in detail in the "Supplement."

pain over the liver. There was a slight loose cough, probably due to excessive use of tobacco. The veins of the legs and abdomen were markedly enlarged, probably due to back pressure from an obstructed portal circulation. The lymphatic systems of the neck, axilla and groin had been enlarged for ten months. Blood pressure readings were: systolic, 125 mm.; diastolic, 80 mm. Heart and lungs were negative. There was no dental history of importance with the possible exception that about January 9, 1924, a gold crown which had been irritating the gingiva around the right mandibular first molar was removed and a gold inlay substituted.

Course of Disease and Treatment.—Under nitrous oxide and oxygen anesthesia, chosen because of the acute local condition, the mandibular third molar was extracted and débris removed from the wound, which was then irrigated and dressed with a half-inch width of gauze. There were symptoms of respiratory obstruction during the procedure, owing probably to the inflamed and congested condition of the upper respiratory tract caused by the general stomatitis. The following day the submaxillary and sublingual glands were swollen and indurated; the face also was more swollen, red and shiny but without evidence of any skin tension. The temperature was normal and no pus was visible; the wound was cauterized, irrigated and redressed. On the third day the swelling was less, and general improvement was noted, which was maintaind until the seventh day when an exudation of pus was noticed around the right mandibular first molar from which a gold crown had recently been removed. The original wound was doing well. On the eighth day some evidence of a generalized gingivitis was noticed, a smear was taken, and Vincent's organisms were found. Sodium perborate routine treatment was instituted and the condition improved. The third molar wound was sluggish in healing, probably due to the mixed infection, and was redressed with gauze for the first seventeen days.

On the thirteenth day a roentgenogram of the right mandibular first molar failed to disclose any evidence of a pathologic condition. On the seventeenth day the patient was much improved. As he had to make a trip to another city, he was advised to have his mouth treated in that city and to continue the sodium perborate treatment. On the twentieth day the patient returned with increased swelling and pain, and evidence of complete neglect of the mouth, which he admitted. The clinical symptoms of Vincent's infection were now very definite. On the twenty-first and twenty-second days the patient became quite weak and another roentgenogram of the mandibular first molar made on the latter date was negative.

On the twenty-third day the patient was confined to bed and was quite weak. The same routine local treatment was maintained, and consultation with the medical adviser of the patient resulted in no change in treatment. There were no developments on the twenty-fourth or twenty-fifth days excepting a tendency of the inflammation to center in the region of the mandibular first molar. On the twenty-sixth day a blood culture was positive for Streptococcus viridans. During these days the temperature was only a shade above normal; but inasmuch as the temperature was being taken by mouth, due to the insistence of the patient because of hemorrhoids, it seems safe to assume

that it was probably somewhat higher, as ice was being used on the face to relieve pain. Deep probing around the gingiva of the mandibular first molar disclosed the presence of several thin flakes of dental cement, which apparently were remains of the fastening cement (used at the time the gold crown had been put on) that had subsequently dropped into the pocket around the tooth when the crown was removed. On the twenty-seventh day the teeth were scaled.

On the twenty-eighth day a well marked ulcer about 0.5 cm. in diameter developed almost directly opposite the right mandibular first premolar (two teeth anterior to the previous center of inflammation—Fig. 1). The ulcer was about 1 cm. below the gingival margin, was not deep, and did not expose the bone. On the twenty-ninth day further consultation with the physician and another oral surgeon resulted in an effort to combat Vincent's infection with salvarsan locally. The ulcer was deeper but not wider. On the thirtieth day a slough appeared around the edge of the ulcer. On the thirty-first day the

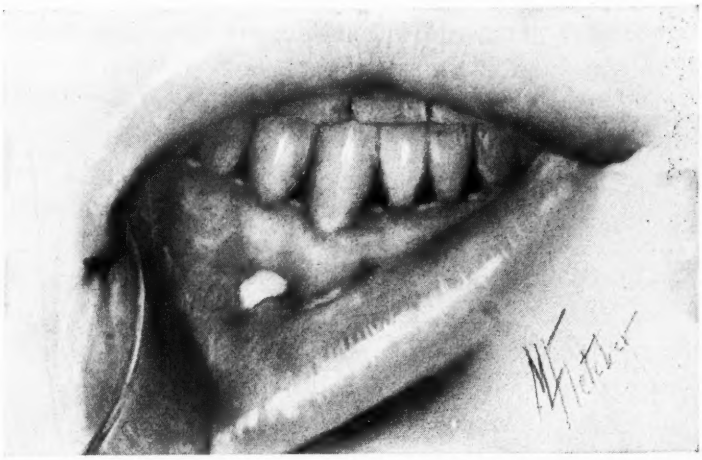

Fig. 1.—Site of the original ulcer in the alveolar mucoperiosteum adjacent to the right mandibular first premolar.

patient felt much better, but the lesion had extended to a point where it would more suitably be termed a slough than an ulcer. On this day the first premolar became quite loose and very sensitive. On the thirty-second and thirty-third days the slough continued to extend; on the thirty-fourth day it seemed no worse, but as all the remaining teeth on the right side had become quite loose and very painful, the remaining right mandibular teeth were removed with local anesthesia. On the thirty-fifth day no change was noted except that pain was less because of the removal of the teeth the previous day. The thirty-sixth day saw the slough again extending; on the thirty-seventh day rapid extension and increased swelling were noted. The slough now extended into the reflection of the buccal mucosa; the mandible was exposed in the premolar and molar regions; and the periosteum was destroyed at the points of exposure.

On the thirty-eighth day further consultation was held with another oral surgeon. Mercurochrome, 5 per cent, was resorted to in an effort to combat the infection. The remedy was used on gauze and the edges of the sloughing

wound were kept comfortably distended with it. By this time rectal temperatures were being taken and had ranged from 100° to 101.4°. On this day the temperature suddenly rose to 103.4°, and for the next several days ranged between that point and a degree lower. On the thirty-ninth day the process continued. On the fortieth day one of us made a definite diagnosis of noma, and on the following day advised hospitalization and a wide use of the actual cautery. In consultation, it was deemed inadvisable to resort to this procedure, because of the poor general condition of the patient. It was decided to attempt to control the condition by using mercurochrome, 1 per cent, intravenously. This remedy had recently been enthusiastically offered to the profession, and it was thought that some benefit might come from its use. The temperature was 103.4° when 13 c.c. were injected. The following day, the forty-second, a seemingly miraculous change had come over the patient. The temperature had dropped to 99.4° for the first time in a number of days, and early in the morning the patient was found sitting up in a chair reading the morning newspaper. The wound looked better, as did the mouth generally. Twelve c.c. more of 1 per cent mercurochrome were injected. There was a

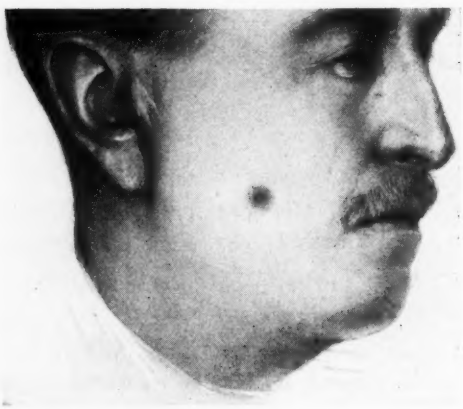

Fig. 2.—Position on the external surface of the cheek of the typical black spot of noma—the point of perforation.

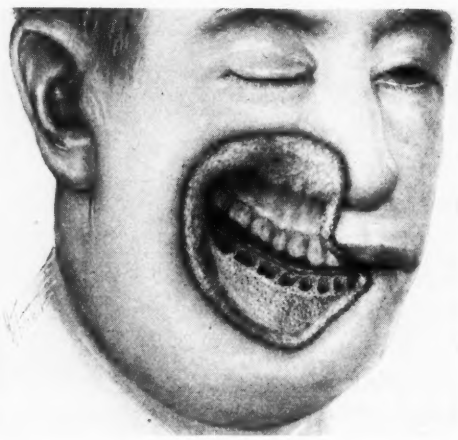

Fig. 3.—Area of destruction of the terminal lesion approximately as it existed at the time of death.

marked reaction to this second injection, however. The patient turned suddenly weaker, bordering on collapse, and no further effort was made along this line of therapy.

On the forty-third day there was no evidence whatever of slough, the wound looked clean, and the odor suddenly disappeared. On the morning of the forty-fourth day the condition still seemed to be improving, but in the evening swelling suddenly increased, and the temperature rose a degree and a half to 102°. No perceptible change took place on the forty-fifth day, but a blood culture again was positive for Streptococcus viridans. On the forty-sixth day the right eye was slightly swollen, and consultation with another surgeon was requested by the family. This consultant disagreed with the diagnosis of noma, believing the condition indicated osteomyelitis. He accordingly advised the use of external heat from radiation lamps. The patient's physician and the writers did not agree with this opinion, but the

prominence of the consultant, the confidence which the family had in him, and the obviously desperate condition of the patient made it seem justifiable to resort to a trial of heat, at least for a short period.

On the forty-seventh day there was a perceptible odor and the first evidence of extension of slough in several days. The heat was stopped immediately. At this time the slough had reached the second molar region posteriorly and the lateral incisor region anteriorly. It had extended up into the cheek and had exposed the mandible below the mental foramen. On the forty-eighth day the slough was further extended, and the maxillary molar on the opposite side had set up an independent infection. The wound was very foul, and the odor was noticeable upon entering the sick room. On the forty-ninth day a dark, almost black, circumscribed area about 1 cm. in diameter appeared on the outside of the right cheek (Fig. 2). On the fiftieth day a perforation developed in the cheek and was extending rapidly. On the fifty-first day the slough had moved rapidly and a large section of it was removed in an effort to clean the wound, decrease toxic absorption and facilitate treatment. The extent of slough through the cheek was much greater than the surface symptoms indicated. A further consultation resulted in giving up the mercurochrome treatment locally, and, instead, an electrolytic chlorine solution on gauze was introduced into the area. It was expected to combat the foulness and hoped to be antiseptic enough to check the bacterial invasion.

From the fifty-second to the fifty-seventh day the patient became much weaker, the destruction continued rapidly, and at times an extension of the slough was noticeable between visits on the same day. On the fifty-third day a culture, taken from a section of slough far up in the cheek away from mouth contamination, was positive for Staphylococcus aureus in pure culture. On the fifty-eighth day the slough approached the corner of the mouth. On the fifty-ninth day the destruction came closer to the mouth. On the sixtieth day the process reached the mucous membrane at the corner of the right lip. The patient had been given morphine sulphate at night throughout the illness in gradually increasing doses. The dosage was now increased to 0.5 gr.

On the sixty-first day the slough broke through the right corner of the mouth, causing the destroyed area in the cheek and the mouth to become one continuous cavity, also attacking the edge of the upper lip. On the sixty-second day the slough was extending very rapidly. By the sixty-third day extensive broadening of the area of slough had taken place, including one-half inch of the lower lip and one-quarter inch of the upper lip. On the sixty-fourth day the patient complained of being blind in the right eye. The respirations had reached 28 for the first time, and the slough had extended one-half inch in all directions overnight. On the sixty-fifth day the slough had gone on for a distance of three-quarters of an inch in all directions and was within three-eighths of an inch of the ala of the right nostril. Slight pulmonary congestion was in evidence. In consultation it was considered advisable to attempt to check the slough by use of a solutin of bromine, 1 dram; potassium iodide, 1 dram; and water, 8 ounces. A dram of the solution was diluted in 7 ounces of water and was applied to the gauze dressing in the wound.

On the sixty-sixth and sixty-seventh days the slough had destroyed about one-half of the lower lip, and had extended well across the upper lip. The patient was unable to swallow. The physician advised against rectal feeding as the case was a hopeless one and death was only a question of a short time. On the sixty-eighth day the ala of the right nostril was destroyed (Fig. 3), the slough had approached the pillars of the fauces, and the sight of the left eye had become affected. The patient had several spasms of the glottis on the sixty-ninth day, indicating the extent to which the slough had extended posteriorly. He was exceedingly weak, although mentally alert, and was receiving one-half a grain of morphine sulphate *ad libitum;* but, getting no nourishment, was very low. After several spasms of the glottis on the seventieth day, the patient expired from acute edema of the glottis.

SUMMARY

The incidence of noma in adults is not common, and this history narrates several interesting phases of the disease with regard to possible etiology, point of origin, course, treatment, and termination. The disease process originated from a small ulcer located on the buccal surface of the mucoperiosteum adjacent to the right mandibular premolar, was complicated by Vincent's infection, spread rapidly through the tissues of the cheek, and resulted in widespread destruction of the face, which extended from the angle to a point approaching the symphysis of the mandible (involving the lower and upper lips almost to the median line, the ala of the nose), and superiorly to the infraorbital structures and zygomatic process. In the terminal stages of the disease the patient became totally blind in the right eye, and showed severe signs of secondary anemia with marked cachexia. The primary fatal lesion was the extensive cancrum oris; the secondary or terminal lesion which caused death was edema of the glottis.

CONCLUSIONS

1. There was no definite evidence in this case that cancrum oris is caused by a specific organism; however, the temporary improvement after intravenous use of mercurochrome might be construed as evidence that there is a bacteriologic factor in the etiology of the disease.

2. No local treatment in this case exerted the slightest retarding influence on the extension of the process of destruction.

3. The use of the actual cautery in this case in an attempt to circumscribe and arrest the disease was contraindicated because of the grave operative risks, so that its possible value was not demonstrable; but the recent development of endothermal and diathermal surgery offers the possibility of a procedure which, if used early in cancrum oris, might be justified in the absence of any other definitely proved remedy.

SUPPLEMENT

Definition.—Cancrum oris (noma) is an affection characterized by a rapidly spreading and progressive gangrene, usually starting as an ulcer in the alveolar mucoperiosteum or buccal mucosa, which tends to perforate the tissues of the cheek leading to extensive sloughing and facial destruction.

Occurrence.—The condition occurs so rarely in those who are past puberty that it is generally considered to be a disease of early childhood, occurring chiefly between the ages of two and eight. The disease occurs almost exclusively in children who are already debilitated by some other disease, most commonly one of the specific infections, especially measles. It may also be observed during the course of or after scarlatina, diphtheria, typhoid, and whooping cough.

It is fortunate that the incidence of the disease is comparatively rare. It is seldom seen in private practice. In institutions it is most frequently observed among poor children who upon admission are in a wretched state of health due to malnutrition and unhygienic environmental conditions. Under such conditions children readily fall victims to infections of all kinds. Because of the infectious nature of noma the cases should be isolated when found in hospital wards. It has been observed in epidemic form, in institutions, because of failure to isolate the first case.

Although the disease is most frequently observed in young children and infants it is not unknown in adult life. Brown[4] describes a case of noma in a young man twenty-two years old who always had been in robust health. The point of origin was distal to a mandibular third molar. The disease pursued a rapid course resulting in death in ten days.

When noma is observed in older persons it is almost invariably a terminal infection or an expression of some pathologic state of a general character, such as pernicious anemia, leucemia, tuberculosis, or diabetes.

Etiology.—Noma is a disease which is undoubtedly infectious in origin. Many bacteriologic studies have been conducted in an attempt to isolate a specifie causative microorganism but without success.

The bacillus described by Lingard has been found in a small percentage of cases. Various other pathogenic organisms have been found frequently in the gangrenous tissues of noma, such as streptococci, staphylococci, diphtheroid organisms, diphtheria bacillus, fusiform bacillus, spirillum of Vincent, and a form of streptothrix.

Attention has frequently been directed to the coexistence of Vincent's infection during the course of noma. Appleton[5] states that fusiform bacillus and spirochetes (the fusospirillary symbiosis) may appear as the predominant organism in smears taken from the gangrenous sloughs. In this regard Appleton cites the experiments of Tunnicliff in which it was found that the subcutaneous injection of killed fusiform bacilli and spirochetes, in a case of noma, caused an increase in the amount of specific opsonin (elevation of the opsonic index), and appeared to produce some beneficial effect upon the patient. The chart of the opsonic curve illustrating the published report of the experiment indicates clearly a rise in the opsonic index following each such injection. In all probability, however, the gangrene of noma is due not to an infection by any single microorganism but to a process dependent upon a mixed infection in the presence of lowered tissue resistance from general debilitation.

[4]Brown, G. V. I.: Surgery of Oral Diseases and Malformations; Lea and Febiger, Philadelphia and New York, 1912.

[5]Appleton, J. L. T. Jr.: Bacterial Infection; Lea and Febiger, Philadelphia and New York, 1925.

Feebleness of circulation, and interference with it by bacterial embolism and thrombosis are probably factors that contribute to the progressive spread characteristic of the gangrenous process. There has been some evidence that noma is due to blocking of the circulation of the tissues through invasion by Vincent's fusiform bacillus and spirochete. Hopewell-Smith[6] states that capillary thrombosis in the cheek, perhaps due to Lingard's bacillus, is probably an important factor.

Morbid Anatomy.—The disease may supervene upon an ordinary ulcerative stomatitis, or it may develop independently as a small localized ulcer. In the latter event the favorite site is the mucous membrane of the cheek near the corner of the mouth. The early process is an inflammatory reaction with round-cell infiltration and an active hyperemia, but soon, possibly due to a thrombosis of the vessels, gangrene sets in. The cheek is affected first. A dusky red or black spot appears on the buccal mucosa and later on the skin surface of the cheek, which is the site of early perforation, after which the tissues become extensively swollen, edematous, and discolored. The gangrenous process spreads rapidly both on the external surface and within the mouth, and sloughing is extensive. There is no apparent effort on the part of the tissues to limit the progress of the gangrenous destruction. The extensive thrombosis of the vessels usually prevents hemorrhage, and owing to destruction of the nerve filaments, there is comparatively little pain.

Course and Symptoms.—The process begins insidiously. The earliest lesion may be a simple localized dissolution of continuity in the alveolar mucoperiosteum or buccal mucosa that later develops into a small superficial ulcer. The ulcer becomes progressively larger, involving the deeper tissues and periosteum and spreading to the adjacent tissues of the cheek. The side of the face becomes much swollen and distorted, and the tissues when felt with the fingers are brawny and hard. The submaxillary and cervical lymph glands become extensively involved, being swollen and indurated. Salivation is marked. Frank pus is seldom seen. The black gangrenous masses form so rapidly that although the wound be cleansed four to six times a day, the dead tissue may be wiped off with cotton swabs at each attempt. It is useless to excise the dead tissue, because the gangrenous process begins immediately at the border of incision.

The teeth are loosened and exfoliated, the periosteum is destroyed, and the maxillary bones become necrotic. An unbearably foul and nauseating odor emanates from the gangrenous area due to putrefaction of the tissues. Although there is great tenderness and pain from pericementitis and periostitis during the early stages of the disease, there is little discomfort from pain during the terminal stages.

Thus a large portion of the side of the face may be destroyed. The gangrenous process may extend into the orbit, the nose may be obliterated, and the normal orifice of the mouth becomes continuous with the cavitation of the cheek.

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[6]Hopewell-Smith, Arthur: Normal and Pathological Histology of the Mouth, vol. II; P. Blakiston's Son and Co., Philadelphia, 1918.

The general symptoms are severe, requiring stimulating and sustaining treatment. The appetite is lost. The pulse becomes weak and thready, and the rate accelerated. The temperature, although often high at first (102°-104°), is usually subnormal before death. The respirations become rapid and shallow during the terminal stages. The patient appears markedly septic and cachectic. There may be profound depression and exhaustion, although mental alertness may be manifested until a few hours before death.

Prognosis.—The prognosis of cancrum oris is exceedingly grave. It has been estimated that 80 per cent of the cases terminate fatally in from ten days to two weeks. When recovery occurs it is usually with marked deformity from cicatrization.

Noma results in death because it exists as a primary fatal lesion as well as a secondary or terminal lesion, that is, one which develops only in those whose vital resistance is so lowered by constitutional disease or poor nutrition that the pathologic process is possible.

Bronchitis and terminal (hypostatic) pneumonia are likely to exist during the last stages of the disease; and when death supervenes, the patient is usually in a state of utter exhaustion due to toxemia and septicemia.

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and Howard R. Raper, D.D.S., F.A.C.D.

TECHNICAL REFINEMENTS FOR SMALL RADIOGRAPHIC UNITS

By Clarence O. Simpson, M.D., D.D.S., St. Louis, Mo.

THE limitations of the 45 kilovolt radiographic units which are generally used by dentists necessitate the application of every possible factor to increase their efficiency. The comparatively low voltage and milliamperage of these machines restrict their use to a short target-film distance. Atmosphere acts as a filter, and there is a loss in the penetration of the rays as the distance is increased. The exposure in milliampere seconds increases in ratio to the square of the distance; so with a maximum capacity of ten milliamperes there is a short practical limit to the distance. To overcome these objections and to prevent vibration of the tube carrier, the manufacturers of dental x-ray units have given instructions that the cone, or cylinder, should be rested on the patient's face. This plan permits of short exposures and stops movement of the tube carrier, but it produces the greater objections of inferior radiographic definition and perspective and excites fear in many patients.

With the cone or cylinder rested on the face the target-film distance ranges from 7½ to 8½ inches, which even with an extremely fine focus tube will not give sharp definition. At this distance there is a divergence of eleven degrees in the direction of the rays passing through the opposite ends of an ordinary dental film, which distorts the images. A marked improvement in definition is obtained by increasing the distance within the limitations of the penetration, and seldom are there indications for extreme speed. If adequate precautions are taken to secure immobility and to emphasize the fact that radiographs are not movies or talkies, exceedingly short exposures will not be required. Except where there is a noticeable vibration of the building from street traffic, movement of the tube is usually the result of careless manipulation in leaving it swaying after the final adjustment. This can be prevented by steadying the tube carrier when releasing hold of it or just before the exposure is begun.

In wire screen tests of the effect of distance upon definition, a remarkable improvement is obtained by increasing the target-film distance from 8 inches to 10 inches. A noticeable improvement continues as the distance is increased

to 20 inches, but the difference is more marked between 8 and 10 inches than a similar increase beyond 10 inches. Since definition is often the decisive factor between certainty and doubt in radiographic interpretation, advantage should be taken of the permissible increase in exposure distance. With slow films the distance can be increased 2½ inches without prohibitively long exposures, and with double-coated films the exposure will still be comparatively short. In having the cone 2½ inches from the face the exposure should be almost double that required with the cone touching the face because of the low penetration.

At a target-film distance of 10 to 11 inches the approximate exposure scale is as follows:

REGIONS		DOUBLE-COATED FILMS	SLOW FILMS
Maxillary	incisor	4 seconds	8 seconds
"	cuspid	3½ "	7 "
"	first molar	4½ "	9 "
"	second molar	6 "	12 "
Mandibular	incisor	3½ "	7 "
"	cuspid	3½ "	7 "
"	first molar	4 "	8 "
"	second molar	4½ "	9 "

This distance is entirely feasible with slow films for most patients, but it is advisable to use double-coated films with the 45 kilovolt machines to reduce the skin exposure in extensive or repeated examinations. With the double-coated speed films which are being introduced, it is probable that the distance may be further increased.

The attempt has been made to get one of the manufacturers of dental units to lengthen the cylinder, but evidently competition prevents any of them from increasing the exposure distance over the arbitrary standard established by electrical engineers. The difficulty in operating with the cone 2½ inches from the face is in maintaining the approximate distance and in accurately centering the cone. The space between the face and the cone may be kept uniform by quickly measuring by the width of three fingers held in a relation to equal two and one-half inches. In calculating the distance for the incisor region, the nose, differing in size, must be disregarded, and the measurement taken from the lip. The nose, and the thickness of the cheek over the second molar region produce a variable factor in distance when the cone is placed on the face. In the mandibular incisor region the film packet may be only ½ an inch from the skin, while in the maxillary incisor and second molar regions it may be over 2 inches. This difference can be regulated in measuring or judging the space between the cone and the face.

It is difficult to center a cylinder accurately, particularly for the maxillary regions where the end of the cylinder is presented at an acute angle to the face. A cone is easier centered at close range, but discrepancies are likely to increase in proportion to the distance from the face and the angle of projection. As an aid in centering, with the bakelite cones, a hole may be drilled in the center of the tip to permit the light reflected from the filament to shine on the patient's face. Unless the room is brightly illuminated, the spot on the face can be distinctly seen to locate the central rays accurately upon the landmark.

The hole should be about 2½ millimeters in diameter, and exactly in the center of the tip. To accomplish this in the hard bakelite, a small hole should be made with a round bur, then enlarged with a fissure bur to correct imperfect centering of the original opening, and finally a 3/32 inch drill passed through the opening to smooth the irregular margins. To graduate the thick-

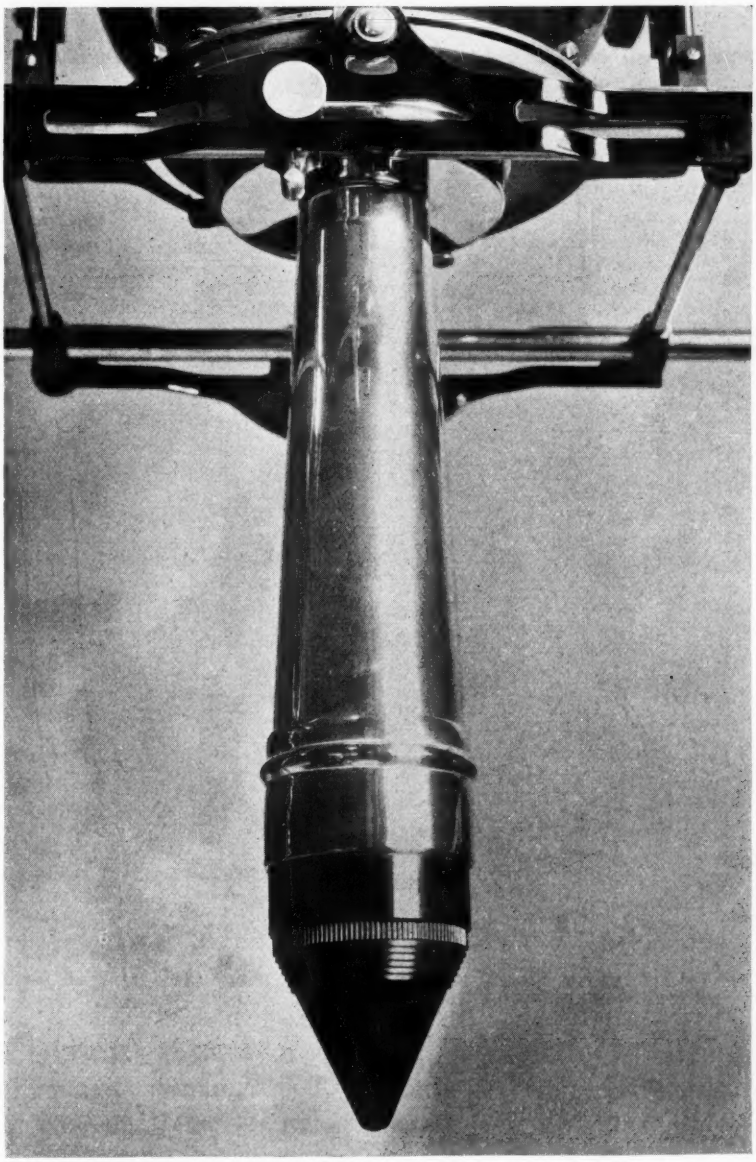

Fig. 1.—An illustration of a perforated bakelite cone attached to a cylinder as an aid in directing the central rays at the anatomic landmarks.

ness of the bakelite to the opening, the hole should be countersunk with a 5/16 inch drill on the inside of the cone. Since the bakelite absorbs a slight amount of radiation, there is theoretically a greater intensity of radiation through the opening, but in practical operation the effect is not evident. A perforated bakelite cone can be attached to the cylinder used on tube stands with equal advantage, as illustrated in Fig. 1.

The precaution in centering the cone on the landmarks is for accurate projection and not to secure the covering of the film. A difference of one inch in the centering of the cone changes the direction of the rays about seven degrees, which makes a distinct difference in the image. If the projection is precisely calculated, any discrepancy in centering the cone introduces material error. In centering on the maxillary regions at angles of thirty to forty degrees with a perforated cone, the distance which the illuminated spot moves on the face from a slight change in the position of the tube is surprising. Also, there is no better method of detecting movement of the patient during exposure than watching the location of the lighted spot on the face.

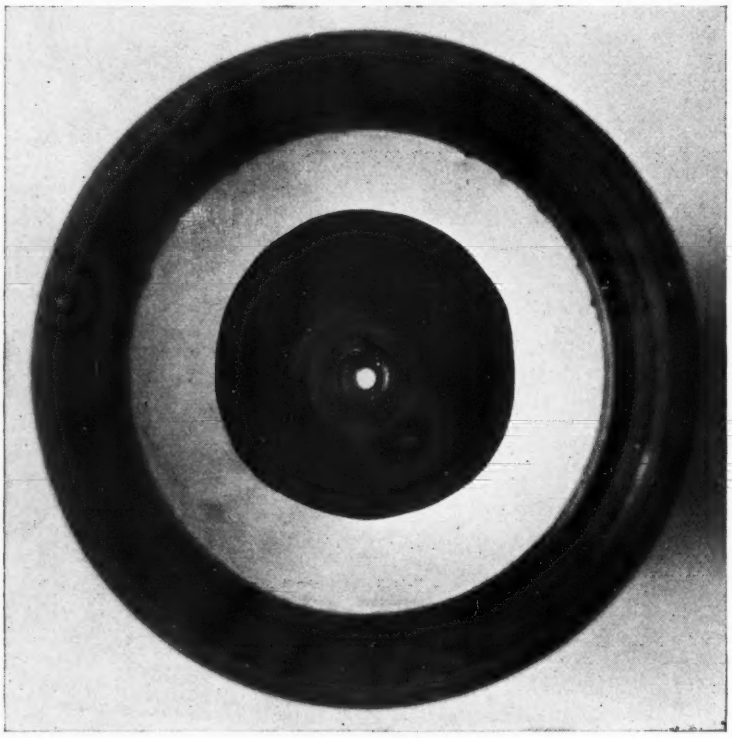

Fig. 2.—View of the inside of a bakelite cone, showing the size of the lead foil diaphragm, and opening through the end.

Instead of a risk of the film's not being covered by exposures, there is too great a latitude in the field of radiation. The regulation dental films are only 1⅝ inches long, but with the cylinder horizontal and touching the face the C D X machine covers an intraoral area of 3½ inches in diameter and an area 4¾ inches in diameter with the cylinder 2½ inches from the face. When the cylinder is inclined from horizontal, a much larger skin area is exposed. With the cone horizontal and touching the face, the Ritter unit radiates an intraoral area 4¼ inches in diameter and an area 6 inches in diameter with the cone 2½ inches from the face. The allowance for over 100 per cent error is carrying foolproofing to an extreme. Anyone who requires a range of 3½ or 4½ inches to hit a 1⅝ inch film, needs blue spectacles and a cane instead of an x-ray machine.

The objections to such a large field of radiation are: (1) It encourages careless technic, in being able to obtain completely exposed films, by directing the cone at most any angle or location on the side of the face. (2) There is an excessive amount of scattered radiation which tends to fog the films and to impair further the inadequate definition. (3) An unnecessarily large skin area is subjected to radiation by each exposure, which greatly increases the total skin dose in extensive or repeated examinations. Whether the cone is placed against the face or the increased distance is used, this fault should be reduced by inserting a lead foil diaphragm in the cylinder or cone as illustrated by Fig. 2. The size of the diaphragm opening should be determined by tests, so that the area of exposure at the target-film distance used will not exceed 3 inches in diameter. The advantages to be gained by applying these suggestions justify the effort entailed by the mechanical and operating changes.

ABSTRACT OF CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Orthodontia, Oral Surgery, Surgical Orthodontia, Dental Radiography

Dental Aid Over the Week-End. Editorial in Am. Dent. Surgeon **26**: 1270, 1929.

The editor arrives at this subject through a communication to the *London Times* in regard to the scarcity of medical men in London over the week-end. The case in question was really one for the dentist, but a medical man may be called on to make an emergency extraction. The editor transfers the problem to the practicing dentist, who is equally prone to be away during this period. He accuses the dental patient in such cases of contributory negligence in regard to his or her teeth, for these sudden demands for extraction seldom appear without a long history of caries and toothache. Such patients pay dearly for their apathy, timidity or stinginess. But while in all large cities the urban practitioners are apt to be absent over Sunday, this is not true of the suburbs for the suburban dentist or physician has not the same incentive to get away from his office and his clientele are also more apt to remain at home and need his services. In fact these suburban and rural practitioners are apt to find Sunday their busiest day, and for this very reason they are not exactly in a favorable position to take over any of the burdens of their urban colleagues. It is obvious that no practical arrangement for this purpose could be forthcoming. Although practitioners are apt enough to employ substitutes during any extended absence, it would hardly do to engage one over a week-end or any similar short period unless for a very definite purpose. Hence the problem must be left to work itself out, and first of all the patient should use a little foresight when he knows that professional men are prone to absent themselves over Sunday.

Enlarged Tonsils, Adenoids and Dental Defects. Am. Dent. Surgeon **26**: 1274, 1929.

The occasion for this editorial is an interim report by the Medical Committee to the Board of Education on the subject of enlarged tonsils and adenoids, which comprises the relations between these conditions and defective teeth. In

this particular, however, the investigation seems to have been imperfect, for we find mention only of oral sepsis. Caries seems to have been ignored outright although a connection has been assumed in the past between adenoids and rickets. Diet is considered in its possible relation to adenoids and enlarged tonsils, and this element is closely associated with the causation of caries, but the latter, as already stated, remains ignored. The children were not even examined as to their teeth. In such an investigation not only caries and oral sepsis should be considered but malocclusion. It seems very strange that when occlusion of the nasal passages and mouth breathing in general are often associated with defective development of the dental arches, dental malocclusion should receive no attention. We may now turn to the yield under "oral sepsis," when we find that this was twice as common as in children with normal tonsils. Criteria for the existence of oral sepsis in these cases seem to be vague in character. The report assumes that there is a necessary relationship between enlarged tonsils and adenoids on the one hand and dental troubles on the other, but thus far the nature of such relationship has not been definitely established. Infected teeth may cause disease of the lymphoid structures, or mouth breathing may favor dental infection, or the two may have a common paternity. It is to be regretted that the Committee did not make better use of its opportunities.

When Does an Infected Tooth Become a Liability? W. A. Price (Cleveland), J. Am. Dent. A. **16**: 3, 1929.

This question is asked and answered incidentally in connection with an extensive research into the calcium metabolism of the fowl, the main object of which is better prevention and treatment of dental ailments. In general if there is for any reason a poor utilization of calcium and phosphorus, the amount lacking for the body needs, which may be increased in disease, must be made good from the bones. Resistance to disease in general is at the same time lowered, and it is then that the infected pulpless tooth becomes a liability. The individual is in a state of negative calcium balance, using the element more rapidly than he can make good the loss. If the strategic value of such a tooth be great, it might offset the risk, but otherwise it is time for the tooth to come out. The vitamines also play a rôle and the subject should in theory receive plenty of milk and butter to insure a sufficient supply of vitamines A and D. The author believes that the frequent colds of some individuals are the result of insufficient vitamine in the food. He believes that individuals may be grouped on a basis of calcium utilization and that while we know that the vitamines stand in close relationship to the latter we are as yet unable to detect the exact relationship while the process of activating cod liver oil and other substances and conferring vitamine D properties on them is already known to be extremely complicated and difficult to control. The groundwork of the author's research is so extensive that it is much too soon to draw conclusions of practical value. Dr. Price does not go so far as to recommend blood tests before extracting dead teeth, but if we understand him correctly that is a logical inference.

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EDITORIALS

Diet Vs. Toothbrush

FOR A SPAN of time which exceeds the memory of living men the toothbrush has been considered an important factor in oral hygiene. The importance of brushing the teeth has been emphasized by the organization of toothbrush drills for the purpose of teaching the children the proper method of cleaning the teeth. Dentists have spent much time trying to educate their patients as to the proper method of brushing the teeth. In fact, the importance of the toothbrush in oral hygiene campaigns has long been recognized.

At present there are a few public health workers, who are anxious to get into public print regardless of what facts they may have to substantiate their statements, who condemn the toothbrush. They claim that the toothbrush is unsanitary because it cannot be made surgically clean. We are willing to admit that some germs will always be found on the toothbrush, but we would like to ask where in this world you will not find germs.

The question of cleanliness is always a relative matter, and the elimination of bacteria is also relative. We find bacteria are so universal that milk inspec-

tors recognize the impossibility of complete elimination of bacteria from milk; they realize that the bacterial count can only be kept within a certain limit.

The toothbrush subjected to an examination will reveal a certain number of microbes, but we must call attention to the fact that everything used in our daily life, knives, forks and dishes, will also reveal a certain number of bacteria, regardless of how clean the housewife may be, or of the Class A rating that a kitchen has received by the Department of Health. Even though we had a toothbrush surgically clean, it would necessarily acquire bacteria as soon as it was used to perform its function.

Those who condemn the use of the toothbrush contend that a proper diet will eliminate the necessity of brushing the teeth. They cite the fact that primitive races did not practice oral hygiene. They call attention to the fact that decay is more prevalent among people who use the toothbrush than it was among primitive people who used no toothbrush.

These facts are true, but they do not disprove the value of the toothbrush. The present diet is the result of civilization and change of environment. It is impossible and impractical for those living in highly civilized communities to employ the same type of food that was used before the process of living became so complicated. If we could reduce the complexity of our life and make it possible and necessary for every individual to employ the same diet as the primitive races, the toothbrush might not be so necessary, although it would still be valuable.

Condemning the toothbrush because it was not used by primitive races can be likened to condemning the sewerage system because primitive races had no sewer systems. In primitive times disposal of sewage was a simple problem, as was the diet. You can argue all you want about the importance of proper foods, but the fact remains that modern living makes it impossible for the mass to obtain the proper food.

During the World War the food administrator attempted to regulate the diet of the American people. A bushel of wheat was found to make considerably more whole wheat flour than white flour. However, nearly everybody objected to eating whole wheat or corn bread except those who were raised in the corn belt. As soon as the restrictions were removed, such beneficial habits of diet as were instituted by the food administrator were dropped, and people reverted to other foods. We see, therefore, that habits of the human family cannot be changed unless our civilization is changed. Civilization has given us white bread and an increase in starchy foods, a diminution of raw vegetables and raw fruits, and a method of cooking which almost eliminates mastication. To compensate for the evil effects of these results of civilization upon the dental apparatus, we are forced to use the toothbrush.

The proper method of brushing the teeth whereby the gums are also brushed has been advocated. We find oral hygiene has supplied a certain stimulus through toothbrush drills which to some extent makes up for lack of function brought about by nonuse of proper foods.

In our modern scheme of civilization we know of nothing which is as advantageous to the preservation of the health of the teeth and gums as the toothbrush.

ORTHODONTIC NEWS AND NOTES

American Society of Orthodontists

The Coming Estes Park Meeting

By Albert H. Ketcham

The twenty-eighth annual meeting of the American Society of Orthodontists which is to be held in Estes Park, Colorado, July 15 to 20 inclusive, will be of great value to all interested in orthodontia. Each annual meeting is an open forum for the discussion of subjects pertaining to orthodontia, expressed in an unbiased, analytic and scientific manner.

Your Executive Committee requests that all those giving papers, case reports, and engaging in discussion give their subjects careful thought, so that they may "say much in a few words," or so that much information may be transmitted in a brief time. In this way those in attendance will be benefited to the maximum degree, thus being able to take home a clear conception of the pros and cons of the subjects discussed. We have at least a dozen men on the program whose lectures are of such great merit that orthodontists travel across the continent or across the ocean to receive from any one of these men the benefit derived from a few lectures. Your officers feel that any one of the sessions is well worth traveling a long distance to attend, and since Denver is only a little west of the center of the United States it may be reached with comparative ease from all North American points.

An idea of the mental stimulus to be gained from this meeting may be had through reading a brief outline of the program. One morning will be devoted to a symposium on nutrition by Dr. McKim Marriott, Dean of Pediatrics, Washington University, School of Medicine, St. Louis, and author of *Recent Advances in Chemistry in Relation to Medical Practice;* and by Dr. J. Albert Key of the Shriner's Hospital and also of Washington University, School of Medicine, who was one of the translators from the French of Leriche and Policard's book, *The Normal and Pathological Physiology of Bone.* Discussion of this symposium will be opened by Dr. John Albert Marshall of the University of California.

Another morning will be devoted to a symposium on muscle function and training by Drs. Alfred Paul Rogers and Homer B. Robinson, illustrated with motion pictures prepared by Drs. Logan and Cooper, and also by motion pictures prepared by Drs. Dinham and Lewis.

Still another morning will be devoted to a symposium on the Simon method of diagnosis in apparent distoclusion cases with papers by Drs. Ben E. Lischer, C. A. Hawley, and Allen H. Suggett. Discussion will be opened by Drs. James D. McCoy, Martin Dewey, Harry Kelsey, and Milo Hellman.

There will be still another program which will partake of the nature of a symposium with a paper by Dr. Milo Hellman, *The Orbital Plane; Its Relation to Dentitions of Different Races, to Dentitions in the Course of Development, and to Dentitions in Malocclusion,* and another paper by Dr. Martin Dewey, *The Constancy of Cusp Position as Related to Facial Forms.*

Dr. Guy S. Millberry, Dean of the College of Dentistry, University of California, will give an interesting and valuable paper on Legal Protection of Educational Standards. Discussion will be opened by Dr. Marcus L. Ward, Dean of the School of Dentistry, University of Michigan.

The afternoons are filled from 1:30 to 4 o'clock with papers, case reports, and clinics, each of great value.

The recreational features have not been neglected. The local arrangements committee under the able leadership of Dr. Henry Hoffman has provided for golf, fishing, swimming, horseback riding, and auto sightseeing trips for the members after the afternoon sessions are over.

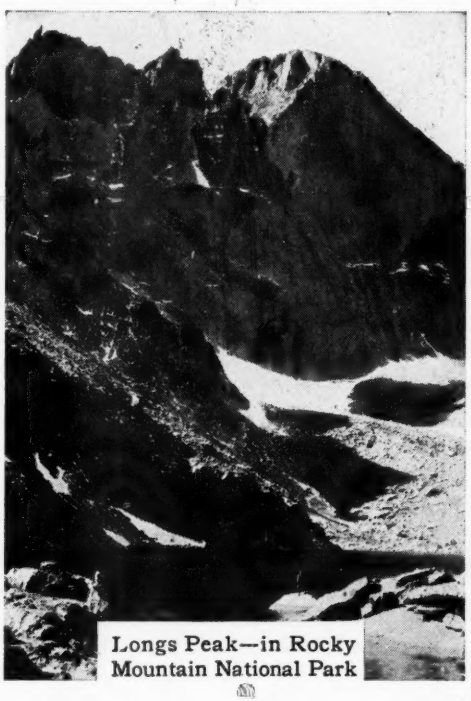
Entertainment has been provided for each afternoon for the ladies, also a nurse or playground instructor will be employed to care for and entertain the children.

Several members have made plans to bring their families and spend the entire summer in Estes Park.

The Playground of the Nation

By Robert L. Gray and Wm. R. Humphrey, Publicity Committee

Recognized by the late Theodore Roosevelt as the "playground of the Nation," there is no region for recreational pastime more wonderful than the Colorado Rockies. Rocky Mountain National Park, the stellar attraction, is indeed the geographic center of



Longs Peak—in Rocky Mountain National Park

the nation's playgrounds and comprises a castellated region of shining peaks, outstanding among which is imposing Longs Peak with an elevation of 14,255 feet above sea level.

At the eastern gateway to this celebrated skyland of recreation is picturesque Estes Park Village, reached through an eighty-five mile motor drive from Denver by way of Big Thompson Canyon, with its sheer rising walls marvelously colored and its rushing, trout-filled stream.

Rocky Mountain National Park is pushing its attendance upward to a quarter of a million visitors and is by far the most accessible of the national parks nearest the large centers of population of the Middle West, the South, and the East, and conveniently reached through motor bus direct from Denver or by motor connection from rail stations at Longmont, Lyons, Fort Collins, Greeley and Loveland.

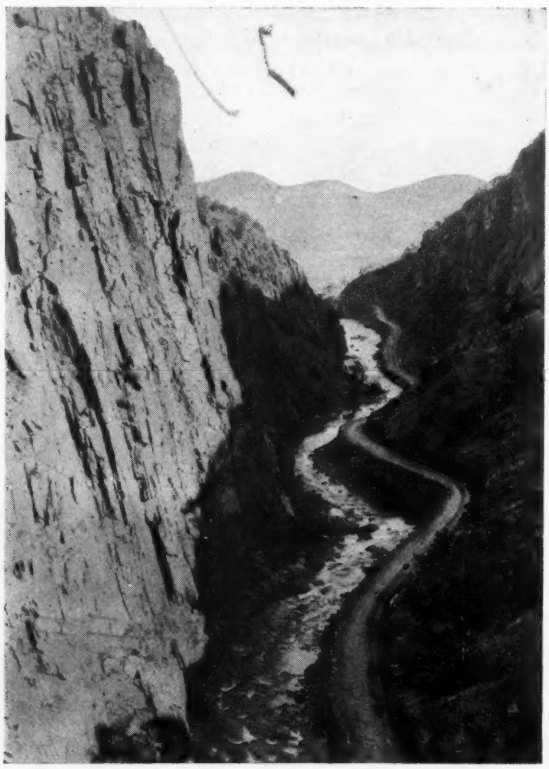
Estes Park Village is nearly a mile and a half above sea level. From there it is about again as much of a rise in elevation to the crest of Longs Peak.

Eagles still hover over the mist-enshrouded, snow-veiled heights of Longs Peak. But the copper-hued Indian and the eagle trap he kept on its crest are gone; instead, there is the traveler with his "arrow" marked camera, loaded and clicking as he "shoots" the

scenic wonders from a peakland caressed by Colorado's azure skies. In this region there is accommodation for all, whether the demand is for the style and comfort of metropolitan hostelries or for the khaki-clad environment of rustic resort.

There are many Indian trails throughout the park; one crossing Flattop Mountain, another over Wind River Trail and still another over Trail Ridge. It was over Trail Ridge that Utes fled from the Arapahoes, and today it is crossed by Fall River Road as a part of the Rocky Mountain National Park Circle Tour of two hundred and forty miles.

Officials of the National Park Service say it is the most spectacular and scenic ride in any of the national parks, twice crossing the Continental Divide, and in July leading through a white-walled canyon of snow fifteen or twenty feet deep. And this surprising feature in travel is experienced in Rocky Mountain National Park on what is the highest continuous automobile stretch in the world, reaching at one point an elevation of 11,797 feet.



Big Thompson Canyon

As an aid to comfort on the circle trip out of Denver there are the Estes Park Chalets, Grand Lake Lodge at Grand Lake, and Placer Inn at Idaho Springs, which are operated by the Rocky Mountain Lodges, Inc. There are also numerous other hotels, resorts, cottage centers, and canyon retreats that give the visitor a choice of seclusion, romantic life in rustic cabin or all the comforts of home life in surroundings that are inspiring and refreshing.

Short trips within the park are many and varied. Glacier Basin, where avalanches of ice and rock in early days have left their imprint in gouged-out pockets; Loch Vale, where water lilies nod their heads in snow-fed pools; Bear Lake, nestling in the shadow of the Continental Divide, and Wild Basin, Hidden Valley, Black Canyon, Horseshoe Park and the High Drive, and a few of the trips of a day or less. There is a twenty-mile jaunt from Estes Park Village to Fall River Pass where a sweeping vision of majestic peaks at the "top of the world" stirs the soul.

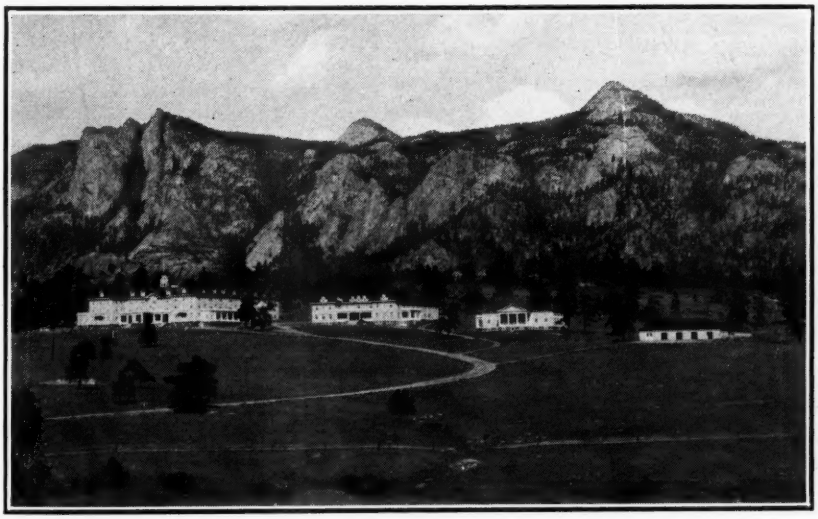
In fact, an entire summer in Rocky Mountain National Park would not exhaust all of the splendors of those cloud-brushed, snow-capped granite-chiseled Colorado Rockies!

Denver, the Queen City of the Plains

Industry's hum in Denver is borne on the wings of romance. In the rush of business there is ever the lure of the Colorado Rockies, and in no other city is this vast array of continuous mountain ranges matched, sentineled as they are by Pikes Peak to the south, Evans Peak to the west, and Longs Peak far to the north.

The snow-capped barrier of 150 miles is much the same today as it was seventy-one years ago when the first white child, William Denver McGaa, was born in Denver and who

Cosmopolitan Hotel, Denver, Information Headquarters



Stanley Hotel, Estes Park, Convention Headquarters

died but recently. Yet in the span of a human life there has blossomed a city of 350,000 people, and pioneer romance blending into scenic splendor makes Denver distinctive, historically and climatically.

Denver is blessed with the stewardship of the Colorado Rockies in that it is the scenic gateway to a vast playground of national parks and national forests easily accessible from the mile-high city.

Nearly 150 trips of a day or less make Denver distinctive as a scenic gateway. Fancy and inspiration will lead the way to Indian trails in Denver's Mountain Parks, which the delegate will enjoy in the sixty-five mile Lariat Trail trip by motor car, trails now widened into comfortable automobile roads, or to the ruins of mining towns where prospectors became rich overnight when the sunset's gold was reflected in the precious ore they took from the hills!

Dr. C. C. Howard of Atlanta, Georgia, fishing in Emerald Lakes near Teelawuket Ranch, Southwestern Colorado

Vacation sports seemingly are without end, from climbing a glacier in the Boulder region, sixty miles away, to enjoying hot mineral pools at Idaho Springs and Manitou.

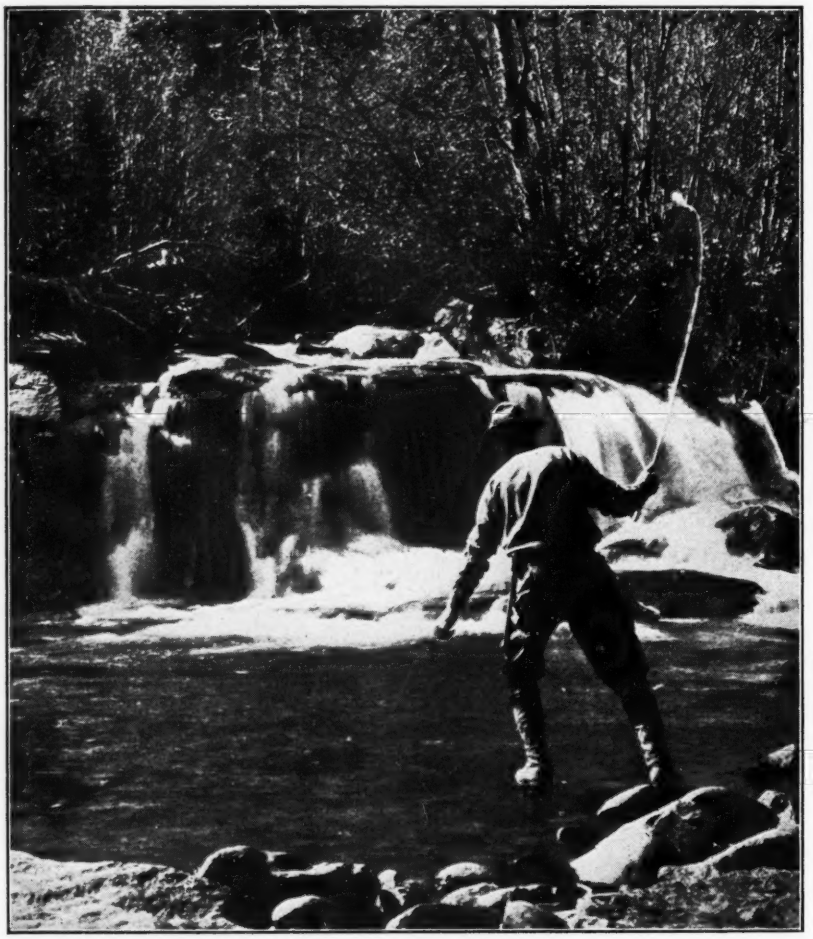
And then there is the novelty of gradually traveling skyward for a mile while covering the distance of fifty-two and one-half miles in the Moccasin Trail drive by auto from Denver to Echo Lake, sparkling gem cupped in the higher Rockies. This drive brings one to the foot of Mount Evans, the elevation of which is 14,259 feet, where eternal vigil is kept nearly three miles above sea level for Denver far below.

Cliff Palace—in Mesa Verde National Park

Snow Tunnel in summer, Fall River Road, between Estes Park and Grand Lake

And as for the nimble angler and the wary trout, there is no better or more delightful place for these two to meet than in the splashing streams near Denver—South Platte River, Bear Creek or Boulder Creek.

So here in Denver the wanderlust of pioneer times is held entrancingly in vacation fancy. A delightful innovation is to spin along watching the reds, yellows and purples against the canopy of azure skies, cloud flecked, painting the sunset's gold, reflected in precious ore which these same prospectors took from the Rocky Mountains.



Dr. F. W. Beesley, of Denver, Colo., fishing in North St. Vrain River

Scenic Lariat Trail

Spectacular Drive Out of Denver Into Colorado's Foothills Thrills Vacationists

There's a romantic road winding through Denver's System of Mountain Parks, a scenic automobile highway, much of which was once an Indian trail, and it is over this winding scenic way that vacationists will be shuttled this summer in comfortable motor busses.

Starting a mile above the sea, where beforehand the traveler becomes enthusiastic over a vista of 150 miles of snow-capped mountains, the first fifteen miles lead past the little white frame house where George Pullman dreamed his idea of a sleeping car, and through Golden, formerly a territorial capital where W. L. Douglas, past governor of Massachusetts and famous shoe manufacturer, worked as a cobbler in 1876.

Denver, by special act of legislature, acquired park areas outside of its municipal boundaries, and today there are forty-four, aggregating more than 10,239 acres, connected by a highway system 100 miles long. The entrance of the mountain parks system is just outside Golden, twelve miles west of Denver, from where a broad gently-graded highway for six miles is thrown, lariat fashion, up the almost perpendicular face of Lookout Mountain. The curves have anchored steel cables for the passengers' safety.

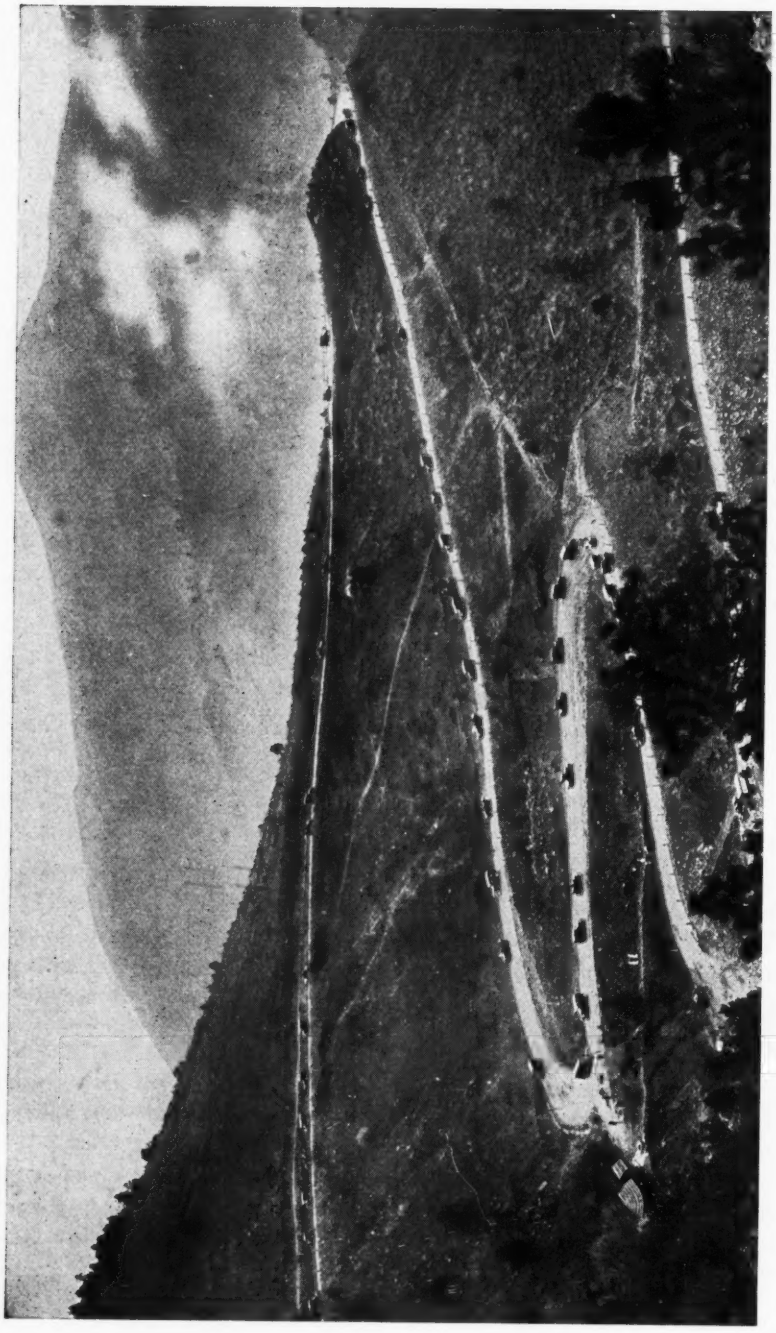
From Lookout Point, near the grave of Col. W. F. Cody (Buffalo Bill) and the museum erected to his memory, the traveler looks across the plains that once held the trails of Indian fighters as well as gold seekers before a railroad tied the Rockies to civilization in 1879. In the museum are the relics of the scout, in the charge of Johnny Baker, Colonel Cody's foster-son.

In the crypt of rough-hewn stone also lies the body of the scout's wife, who shared many of his adventures and helped to perpetuate his memory, historically, as the personification of the Old West.

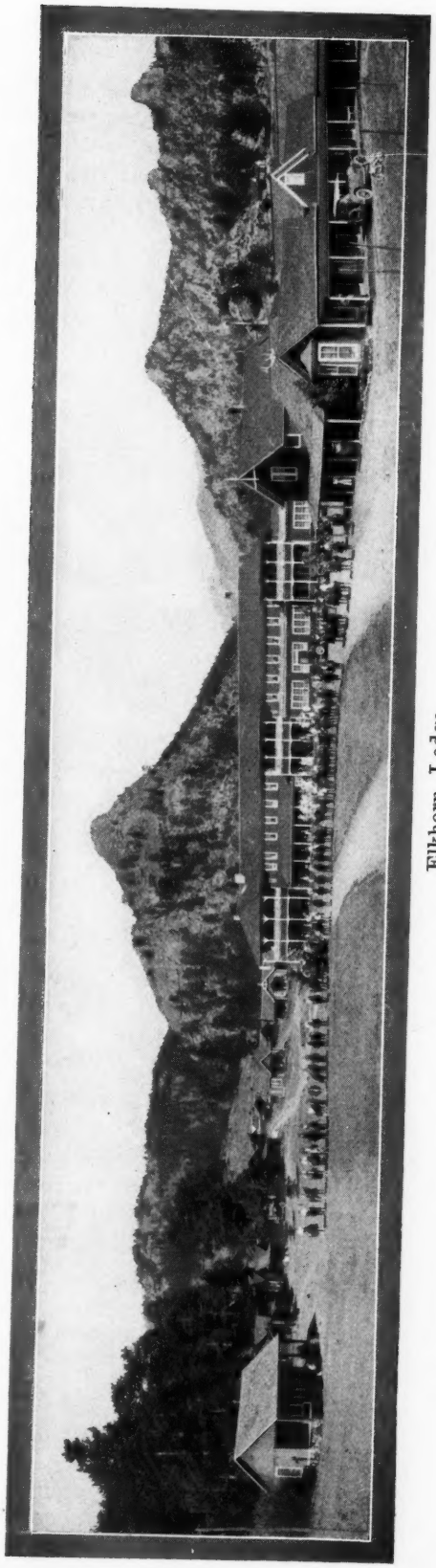
Near by is Chief Hosa Lodge which contains a World War Museum directed by the American Legion and the "40 and 8" of Denver.

Past Colorow Point, where renegade Utes expiated unforgivable crimes in leaping to their death 2,000 feet into Clear Creek Canyon, the way leads past Denver's Mountain Game Preserve to Fillius and Bergen Parks, and skirts Troutdale before entering Bear Creek Canyon. In a homeward direction between towering canyon walls and along sparkling Bear Creek the ride continues. Great rock upthrusts at Morrison indicate the place where the thigh-bone of an Atlantosaurus, the largest land animal known to the scientific world, has been unearthed. This saurian probably was eighty feet in length and thirty-five feet tall when standing on its hind legs.

Leaving the Morrison gateway to the mountain park system, the nineteen miles into Denver with city lights blinking through twlight shadows again brings to mind civilization's progress. It is an inspiring trip requiring only four hours but whch will live in memory forever.



Lariat Trail



Elkhorn Lodge

The Chalets, Estes Park

Attention is called to the cut of the Estes Park Chalets. These Lodges are in a beautiful location, overlooking lovely Mary's Lake which is well stocked with rainbow trout. They have comfortable rooms, delicious cuisine, and we feel very fortunate to have the promise of reservations for our members at these lodges, as on account of the heavy registration for the meeting it was found necessary to secure an additional hotel. The Chalets are operated by the Rocky Mountain Transportation Company, and free bus service will be furnished from them to our meetings at the Stanley, about fifteen to twenty minutes being required for the trip, which is very scenic.

With these accommodations added to those at the Stanley, Crags, Elkhorn and Lewiston Hotels, our members have the choice of the cream of the accommodations in the Rocky Mountain National Park.

Estes Park Chalets

On the trip to the Park last Sunday, May 12, Dr. Beesley saw many wild deer. A bunch of seven were enjoying themselves on the shores of Mary's Lake in front of the Chalets. As the snow recedes towards the mountain tops the deer go up higher.

By the time this is published the orthodontists of America will have received a booklet entitled, "Colorado, Where to Stay in the Rocky Mountain National Park." This booklet gives a more complete description of the Estes Park Chalets.

Bunk From the Bunkers

By Archie Brusse

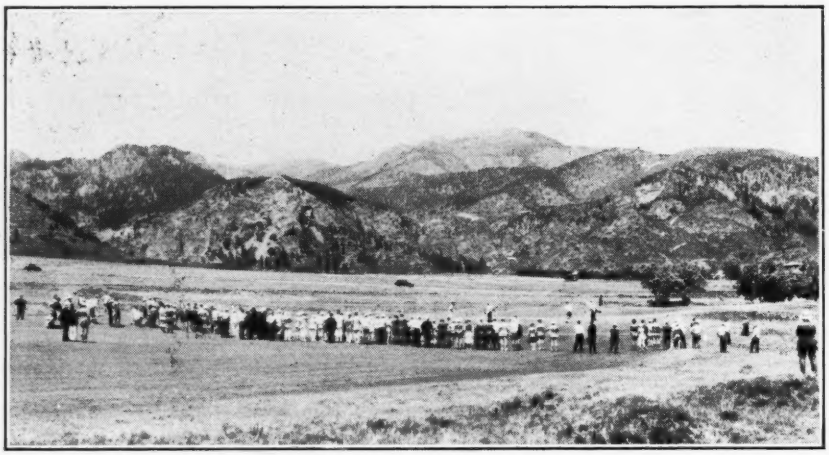
For the benefit of those who did not make the Ryder Cup Team, the local golf committee of the American Society of Orthodontists has conferred with the different country clubs of Denver and vicinity for the purpose of providing suitable entertainment for the visiting golfers during their sojourn in Colorado. According to latest reports, however, you are very fortunate in failing to make the Ryder Team, for all that we have heard since the boys set foot in England is in relation to the cold, wind-swept courses; all very well in a test for skill, perhaps, but not so good when one is out for actual pleasure.

Lakewood Country Club where the 1929 Denver Open Tournament will be held July 25, 26, and 27, 1929

Golfing is ideal in Colorado, particularly during the summer months, for it is never too hot and never too cold, and when most courses are burned up by the torrid heat, the courses of Colorado are at their best. We heartily advise all who have ever played golf to take their clubs out of the moth balls, bring along an extra dozen repaints, and be prepared for a week of pleasurable sport. The committee has been trying to find time for a tournament, but this would take at least a half day, and in looking over the program it seems impracticable. Arrangements will be made, however, which will provide plenty of good golfing for golf enthusiasts.

The committee also realizes that most of the members who come will be taking their vacations along with this meeting, and with this fact in mind, we wish to describe briefly some of the courses in Colorado.

At Estes Park, for instance, in the Heart of the Rockies is located an eighteen-hole course which is said and is known to be one of the very finest mountain courses to be found in the country. It is especially impressive with the majestic mountains towering above and encircling it, and that such a course is possible in such a location is in itself a fact well worth remembering. There is a rustic, log club house providing adequately for the comfort of the guests, and there are tennis courts in connection with the golf course for those who prefer tennis to golf.



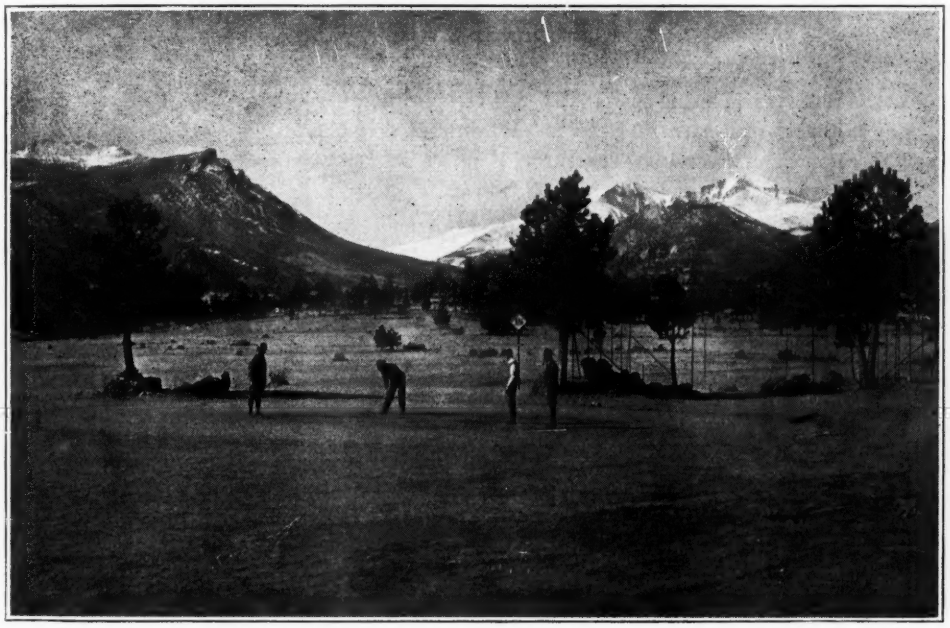
A bird's-eye view of the wonderful Broadmoor Golf Course at Broadmoor, Colorado Springs

The city of Denver has four excellent courses: the Denver Country Club, the Cherry Hills Country Club, the Wellshire Country Club, and the Lakewood Country Club, all eighteen-hole grass courses, with lakes and ditches, rivers and water hazards. The Colorado Golf Association has been kind enough to date the annual Denver Open Tournament at the Lakewood Country Club for Friday, Saturday and Sunday, July 25, 26, and 27, for the benefit of those who wish to stay over after the meeting, the Lakewood course will be open for practice all week. This will be seventy-two-hole medal play—eighteen holes Friday, eighteen holes Saturday afternoon, and thirty-six holes Sunday. Handsome prizes will be awarded for the lowest gross score, the lowest score for the best eighteen-hole round, the player who makes the most birdies, etc. This is without doubt one of Denver's biggest golf events and should receive special consideration.

Following this, on Tuesday, July 29, there will begin the first qualifying round of "The Broadmoor Open" at beautiful Broadmoor, Colorado Springs, a marvelous affair for which prizes exceeding $1000 are awarded golfers of every kind and description, from seniors (those over the half-century mark) to players of championship caliber, and "dubs." There are week-end sweepstakes and medal play competition. If you have never played golf where mountain and plain meet, or teed up with the fairway in a direct line with the summit of Pikes Peak, if you have never enjoyed the champagne air of the Pikes Peak region or walked the springy turf at the foot of Cheyenne Mountain, if you have never done these

things, then make your plans at once for a visit to Broadmoor and the Broadmoor Golf Club, and make your reservations as soon as possible, for the hotel is crowded to capacity all summer. It is a lovely ride of only an hour and a half from Denver on paved roads.

On this wonderful, eighteen-hole course which was laid out by Donald Ross, nationally known golf architect, the 1927 Trans Mississippi was played and golfers came to Colorado Springs from all parts of the country, making their headquarters at the Broadmoor Hotel. On these marvellous links you will find variety on every hole; at the first, whose fairway parallels the lake west of the hotel and where the mountain trout jump up and catch your drive; at the sporty short thirteenth, and at the last, to reach which your second must clear another section of the lake. There are other short and long ones, fat and thin ones, all



The Wonderful Mountain Course at Estes Park, Colorado

wholly delightful. When you're not shooting at Cheyenne Mountain and the Zoo, you're playing in the direction of Pikes Peak or the shaded purple of the distant prairies far below and to the east.

There is also a magnificent club house with glassed-in lounges, dining rooms, luncheon counters, "The Nineteenth Hole" and everything the heart could desire. A big recent attraction was the completion of a $60,000 wing to the club house, which now is equipped with squash racquet courts, the only ones in Colorado, although we have squash tennis courts in Denver at the Country Club, handball courts, bowling alleys and a gymnasium.

Artists delight in Broadmoor, junction of mountain and plain—so do golfers. It is ideal, typifying the wide, open spaces of the real West. If you are anxious to say that you have played the West's most notable courses, visit Broadmoor, visit Estes Park, and be assured.

Twenty-Eighth Annual Meeting of the American Society of Orthodontists

MONDAY EVENING TO SATURDAY AFTERNOON, JULY 15-20,
ESTES PARK, COLORADO

MONDAY, JULY 15, 1929

Evening Session

8:00 A.M. Wild Life in the High Country. (Illustrated with Motion Pictures and Autochromes.) By Joe Mills, Estes Park, Colorado.

TUESDAY, JULY 16, 1929

Morning Session

8:30 A.M. Registration.

9:00 A.M. Business Meeting:
Report of Board of Censors—William E. Flesher.
Report of Secretary-Treasurer—Charles R. Baker.
Report of Librarian—Abram Hoffman.

9:30 A.M. President's Address. By Albert H. Ketcham, Denver, Colorado.

10:00 A.M. Organizing for Pleasant and Efficient Practice. By James D. McCoy, Los Angeles, California.
Discussion opened by B. Frank Gray, San Francisco, California.

10:45 A.M. Apical Absorption, a Progress Report of the Research Work Conducted at the University of California Under the Orthodontic Research Grant. By John A. Marshall, D.D.S., Ph.D., Professor of Biochemistry and Dental Pathology, College of Dentistry, University of California, San Francisco, California.
Discussion opened by Harry E. Kelsey, Baltimore, Maryland.

11:45 A.M. Case Report. Interception of Malocclusion in Cases of Multiple Loss of Deciduous Teeth. By Raymond C. Willett, Peoria, Illinois.
Adjournment.

Afternoon Session

1:30 P.M. Case Reports:
By Harold Chapman, London, England, presented by William C. Fisher, New York City. Subject to be Announced.
Open-Bite Closed by External Pressure. By Clinton C. Howard, Atlanta, Georgia.
Additional Data Reporting on a Young Case of Excessive Over-Bite. By Frank A. Delabarre, Boston, Massachusetts.

2:30 P.M. Legal Protection of Educational Standards. By Guy S. Millberry, Professor of Chemistry and Metallurgy and Dean of University of California, College of Dentistry, San Francisco, California.
Discussion opened by Marcus L. Ward, Ann Arbor, Michigan; Walter H. Ellis, Buffalo, New York.
Adjournment.

WEDNESDAY, JULY 17, 1929

Morning Session

9:00 A.M. Business Meeting. Reading of Minutes.

Symposium on Nutrition

9:10 A.M. Nutrition in Its Relation to Dentition and Bone Growth. By McKim Marriott, Dean and Professor of Pediatrics, and Physician-in-Chief, Washington University School of Medicine, St. Louis, Missouri.
Bone Atrophy. By J. Albert Key, Director of Research Department of Shriners' Hospital for Crippled Children, St. Louis, Missouri.
Discussion opened by John Albert Marshall, San Francisco, California; Henry F. Hoffman, Denver, Colorado.

11:45 A.M. Case Report: Impacted and Supernumerary Teeth. By William A. McCarter, Topeka, Kansas.
Adjournment.

12:15 P.M. Round Table Luncheon and Discussion. Stanley Manor.
Chairman, L. M. Waugh, New York City.

General Plan

A *Topic Leader* was selected from each one of the following sections:

1. Canada
2. Chicago Association
3. Great Lakes Association
4. New York Society
5. Northern California Section
6. Rocky Mountain Society
7. Southern California Section
8. Southern Society
9. Southwestern Society
10. Washington, Oregon Section

(a) Each Leader was requested to select the title of his topic, so that questions of special interest to any section would not be overlooked. The Chairman censored the proposed topics to avoid duplication and also assigned subjects to those so desiring.

(b) Each Leader then prepared a questionnaire on his topic and mailed it to the fifteen members whom he desired to take part with him. He tabulated these and prepared a *Summary with Conclusions* in advance, this to be read and discussed *during* the Luncheon, and such modification made as the group might decide. In this way opinions may be obtained even though some are prevented from being present.

(c) Immediately after Luncheon the Assemblage will convene in the Casino for Presentation of the Summary Reports.

(d) One of the most important advantages of this method will be the possibility of having the reports ready to be handed in for publication *immediately* after having been presented.

(e) Five minutes will be allowed for the presentation of each report.

IMPORTANT—Every member and guest is urged to attend the luncheon. Additional tables with Topic Leaders have been provided so that all may take part.

Table No. 1
Topic.—Consideration of the Individual Normal.
Topic Leader: James C. Allan, New York City.

Table No. 2
Topic.—Treatment of Neutroclusion Associated with the Supraclusion of the Lower Anterior Teeth.
Topic Leader: E. B. Arnold, Houston, Texas.

Table No. 3
Topic.—Are the Vitamin Values and the Calcium and Phosphorus Ratio of the Blood Factors in the Orthodontic Problems?
Topic Leader: J. A. Burrill, Chicago, Illinois.

Table No. 4
Topic.—(a) What Should the Term "Preventive Orthodontia" Include?
(b) How May this Best be Taught the General Practitioner of Dentistry?
Topic Leader: Wyatt B. Childs, Macon, Georgia.

Table No. 5

Topic.—Should Orthodontia be More Widely Separated from Dentistry?
Topic Leader: Oliver H. Devitt, Denver, Colorado.

Table No. 6

Topic.—Open Bite Cases, Their Treatment and Degree of Success of Retention.
Topic Leader: W. J. Furie, Long Beach, California.

Table No. 7

Topic.—In View of the Increasing Number of Dentists Engaging in Orthodontia Without Proper Preparation, What in Your Opinion is the Best Means of Meeting this Condition?
Topic Leader: Charles C. Mann, Seattle, Washington.

Table No. 8

Topic.—On the Basis of Scientific Observation may Heredity be Accepted or Must it be Rejected as a Causative Factor to be Considered in the Diagnosis of Dentofacial Deformity.
Topic Leader: George R. Moore, Ann Arbor, Michigan.

Table No. 9

Topic.—Impacted Upper Cuspids—Their Treatment.
Topic Leader: Allen E. Scott, San Francisco, California.

Table No. 10

Topic.—What is the Most Important Problem Confronting Orthodontics Today?
Topic Leader: William W. Woodbury, Halifax, Novia Scotia.

Afternoon Session

1:30 P.M. Presentation of the Summary Reports of the Round Table Discussion. Chairman, Leuman M. Waugh, New York City.

2:45 P.M. A Study of the Maxillary Sinuses by Repeated Radiographs from Birth to Seven Years. By W. Walter Wasson, M.D., Denver, Colorado.
Discussion opened by Clinton C. Howard, Atlanta, Georgia.

3:30 P.M. Business Meeting. Committee Reports:
Report of Committee on President's Address.
Report of Interrelations Committee, William C. Fisher, Chairman.
Report of Scientific Research Committee, Harry E. Kelsey, Chairman.
Report of Education Committee, Oren A. Oliver, Chairman.
Nomination of Officers.
Place of Meeting.
Adjournment.

THURSDAY, JULY 18, 1929

Morning Session

9:00 A.M. Business Meeting. Reading of Minutes.

Symposium on Apparent Distoclusion

9:15 A.M. Differential Diagnosis and Prognosis. By B. E. Lischer, St. Louis, Missouri.
Methods of Treatment. By C. A. Hawley, Washington, D. C.; Allen H. Suggett, San Francisco, California.
Discussion opened by James D. McCoy, Los Angeles, California; Martin Dewey, New York City, New York; Harry E. Kelsey, Baltimore, Maryland; Milo Hellman, New York City, New York.
Adjournment.
Luncheon for Past Presidents, President, and President-Elect.

Afternoon Session

1:30 P.M. Clinics:

No. 1. Application of Coil Springs. By E. B. Arnold, Houston, Texas.

No. 2. Some Methods and Attachments Used in the Bodily Movement of the Teeth. By E. N. Bach, Toledo, Ohio.

No. 3. Group of Casts Showing the Occurrence of Similar Conditions in Families. By O. W. Brandhorst, St. Louis, Missouri.

No. 4. X-rays of Interest in Orthodontia. By I. C. Brownlie, Denver, Colorado.

No. 5. X-ray Helps. By Wyatt B. Childs, Macon, Georgia.

No. 6. A New Impression Material. By H. A. Denbo, Chicago, Illinois.

No. 7. Profilograph, Showing a Study of Several Cases. By Martin Dewey, New York City, New York.

No. 8. Vertical Development. By Robert A. Dunn, San Francisco, California.

No. 9. Planing and Polishing Roughened Enamel, and Removing Superficial Decay in Gingival Third of Tooth Surfaces. By A. C. Hamm, Denver, Colorado.

No. 10. A New Model Trimmer. By Russell E. Irish, Pittsburgh, Pennsylvania.

No. 11. The Technic of Using the Loop Band and Cemented Lock in Making Appliances. By Joseph E. Johnson, Louisville, Kentucky.

No. 12. Lingual Lock. By Harry E. Kelsey, Baltimore, Maryland.

No. 13. Photographic Report of Eight Cases. By Victor Lay, Buffalo, New York.

No. 14. Gnathostatic Diagnostic Records.

(a) Plaster Denture Reproductions. By B. E. Lischer, St. Louis, Missouri.

(b) Photostatic Facial Reproductions. By C. A. Hawley, Washington, D. C.

No. 15. Some Methods of Spring Extensions for Labial Appliances. By Lloyd S. Lourie, Chicago, Illinois.

No. 16. Research Exhibit. By John Albert Marshall, San Francisco, California.

No. 17. Technic of Modelling Compound Impressions. By James D. McCoy, Los Angeles, California.

No. 18. Unnecessary Treatment Avoided by Thorough Diagnosis Based on Periodic Observations. By George R. Moore, Ann Arbor, Michigan.

No. 19. Third Molars and Their Relation to Orthodontic Treatment. By Harry L. Morehouse, Spokane, Washington.

No. 20. The Various Types of Auxiliary Springs and Their Uses. By Oren A. Oliver, Nashville, Tennessee.

No. 21. Graded Seamless Bands for Upper and Lower Incisors. A New Plier for Inserting Lingual and Labial Appliances into Locking Positions. By Herbert A. Pullen, Buffalo, New York.

No. 22. Registering Facial Profiles by Means of X-ray. By Sidney E. Riesner, New York City, New York.

No. 23. Removable Retainer with Clasp Attachments. By T. Wallace Sorrels, Oklahoma City, Oklahoma.

No. 24. Efficient Application of Separating Ligatures (Movie Film). By Charles A. Spahn, Newark, New Jersey.

No. 25. Labial and Lingual Appliances. By Harry A. Stryker, Los Angeles, California.

No. 26. The Percentage of So-called Distoclusion Cases in Which the Gnathostatic and Photostatic Pictures Show that the Maxillary Teeth are Correct Mediodistally. By Allen H. Suggett, San Francisco, California.

No. 27. Appliances and Methods Employed in Closing Spaces Resulting from Loss of First or Second Permanent Molars. By Hugh G. Tanzy, Kansas City, Missouri.

No. 28. Some Additional Data on Root Resorption Problems. By John F. Taylor, Los Angeles, California.

No. 29. Plaster Impressions. By Albert Edward Voss, Los Angeles, California.

No. 30. Practical Model Trimmer. By Fred Wolfsohn, San Francisco, California.

FRIDAY, JULY 19, 1929

Morning Session

9:00 A.M. Business Meeting. Reading of Minutes.

Symposium

9:15 A.M. Muscle Function, Its Effect on Osseous Development, and Its Relation to Orthodontic Treatment (Illustrated). By Homer B. Robison, Hutchinson, Kansas.

A Helpful Point of View. By Alfred Paul Rogers, Boston, Massachusetts. Illustrated with:

Motion pictures prepared by William R. Dinham, Seattle, Washington; Paul D. Lewis, Seattle, Washington.

Motion pictures prepared by Herbert K. Cooper, Lancaster, Pennsylvania; H. L. Logan, Mount Carmel, Pennsylvania.

Discussion opened by William R. Dinham, Seattle Washington; Martin Dewey, New York City, New York.

12.00 NOON. Case Report: Demonstrating the Advisability of Complete X-ray Examination Before Starting Treatment. By Henry F. Hoffman, Denver, Colorado.

Adjournment.

Afternoon Session

1:30 P.M. Case Report: The Correction in Certain Cases of Posterior Occlusion with the Bite Plane. By Oren A. Oliver, Nashville, Tennessee.

2:00 P.M. The Constancy of Cusp Position as Related to Facial Forms. By Martin Dewey, New York City, New York.

The Orbital Plane: Its Relation to Dentition of Different Races, to Dentitions in the Course of Development, and to Dentitions in Malocclusion. By Milo Hellman, New York City, New York.

Discussion opened by Abram Hoffman, Buffalo, New York; Allen E. Scott, San Francisco, Calif.

3:30 P.M. Business Meeting. Reading of Minutes.

Installation of Officers.

Inaugural Address. By Oren A. Oliver, Nashville, Tennessee.

Adjournment.

SATURDAY, JULY 20, 1929

Morning Session

8:00 A.M. (Sharp) Leave Hotels.

Trip to Fall River Pass, over two miles above sea level. This trip is a part of the entertainment program which is being offered through the courtesy of the members of the Rocky Mountain Society of Orthodontists.

12:30 P.M. Return to Hotels.

A Real Wild West Rodeo will be in Cheyenne, Wyoming, the week following the A. S. O. Meeting.

NOTE.—The preceding arrangement of the Program of the Society of Orthodontists is incomplete and subject to change.

Officers

Albert H. Ketcham, *President*, Denver, Colorado.
Oren A. Oliver, *President-Elect*, Nashville, Tennessee.
Charles R. Baker, *Secretary-Treasurer*, Evanston, Illinois.
Abram Hoffman, *Librarian*, Buffalo, New York.

Board of Censors

William E. Flesher, *Chairman*, Oklahoma City, Oklahoma.
Leuman M. Waugh, New York City, New York.
Paul G. Spencer, Waco, Texas.

To the Boys of the Rocky Mountain Society:

I want to express to you my appreciation for the many courtesies shown me while I was your guest in Denver. I was indeed glad to learn of the cooperation and work which the Rocky Mountain Society is doing to make the meeting of the American Society of Orthodontists a great success. As far as I can see, nothing is being left undone for the success of the meeting in July.

It was a great pleasure for Mrs. Oliver and me to make the trip to Estes Park in mid-winter. Leaving your very delightful city, we motored in the sunshine to Estes Park and there were greeted by a snow storm. Estes Park is a very beautiful basin of practically level or rolling surfaces with great peaks surrounding it.

The arrangements which you have made for hotel reservations are ideal. It is a great pleasure for me to recommend that every member of the Society bring his wife and children with him so that they, too, may enjoy the delightful hospitality, wonderful scenery and invigorating air of Estes Park. Denver's park playground teachers will take care of the children during the meeting.

There is something different about Estes Park from other places you have been. I do not hesitate to say that if all of the members of the Society could have visited Estes Park at the time I did that you would have each member present, including his wife and children.

With best wishes to each of you, I am

Yours fraternally,
Oren A. Oliver.

The Morris L. Chaim and The Benjamin Lord Prize for 1929

The First District Dental Society of the State of New York announces a prize of $250.00 offered by the Morris L. Chaim Fund and a prize of $150.00 offered by the Benjamin J. Lord Fund, to be known as the Morris L. Chaim Prize and the Benjamin Lord Prize respectively. These prizes are to be awarded annually at the discretion of the Board of Directors.

Conditions:

1. *Eligibility.* Membership in good standing of any bona fide dental, medical, or scientific society, or duly registered student of a recognized educational institution, prior to submission of the manuscript.
2. *Date.* Papers are to be submitted on or prior to November 1, 1929, to the Secretary of the First District Dental Society, 2 East 103rd Street, New York City.
3. *Papers.* A. The Morris L. Chaim Prize is offered for the most acceptable paper in the field of science and art as related to dentistry, which paper embodies the results of original research not previously published.
   B. The Benjamin Lord Prize is offered for the most acceptable paper in the field of clinical dentistry having an immediate and direct value in its application to practical

needs, which paper embodies the results of original research not previously published.

The manuscript shall be typewritten, and accompanied by all necessary photographs, drawings, diagrams and tables and shall be ready for publication.

The manuscript and all drawings, diagrams, photographs, tables, data, etc., shall be sealed in a plain wrapper or envelope which shall bear on the outside some symbol, group of letters, figures or other identification mark, and accompanying each such sealed packet or envelope, another sealed envelope having on the outside a duplicate of such symbol, group of letters, figures or other mark, and within this sealed envelope shall be placed the name and address of the person submitting the manuscript, etc.

4. *Award.* The award shall be made by the Board of Directors of the First District Dental Society of the State of New York. At the discretion of the Board, the prizes may be divided between the papers adjudged to be of equal merit, or both prizes awarded for one paper, if in the opinion of the judges it merits them.
5. *Publication.* The First District Dental Society of the State of New York will consider the publication of the successful papers, but publication by the First District Dental Society of the State of New York shall not be binding on either party.
6. *Wherever* and whenever published, the papers awarded the prizes shall be accompanied by the statement: "Awarded the Morris L. Chaim or the Benjamin Lord Prize, or both, in 1929, by the First District Dental Society of the State of New York."

Further information may be had by addressing: E. M. Davies, General Secretary, First District Dental Society, New York Academy of Medicine, 2 East 103rd Street, New York City.

December Meeting for Better Dentistry, First District Dental Society, New York

The First District Dental Society of New York will hold their Fifth Annual December Meeting for Better Dentistry at the Hotel Pennsylvania, December 10-14, 1929.

The officers of the Society have made arrangements to continue their meetings on the same plan as heretofore and expect that the profession will again support them in making this meeting a success.

Notes of Interest

Dr. Franklin A. Squires announces the removal of his office to The Medical Center, Maple and Davis Avenues, White Plains, New York. Practice limited to orthodontia.

Dr. Adelbert Fernald wishes to announce that after April 1 he will be located in his new offices at Haddon Hall, 29 Commonwealth Avenue, Suite 201, Boston, Mass. Practice limited to orthodontia.

Dr. A. Jacobsmeyer announces the removal of his offices to Suite 1012 Paul Brown Building, St. Louis, Mo. Special attention given to periodontia.

Dr. A. LeRoy Johnson, of 576 Fifth Avenue, New York City, announces that he is at the office of Dr. T. K. Lindstedt, 245 Greenwich Avenue, Greenwich, Conn., on Wednesdays for consultation and treatment of orthodontic cases.